



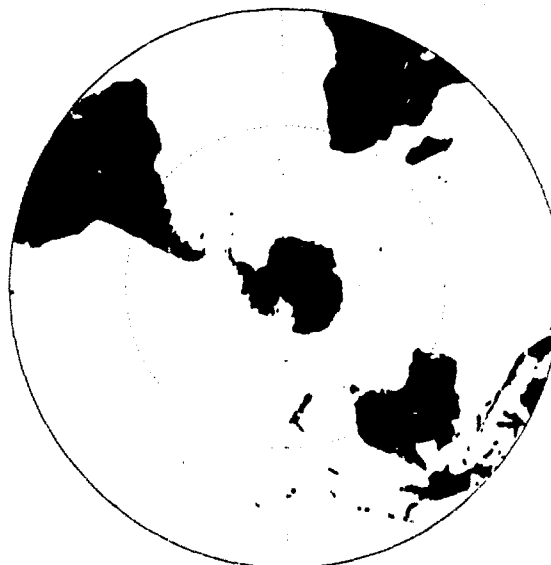
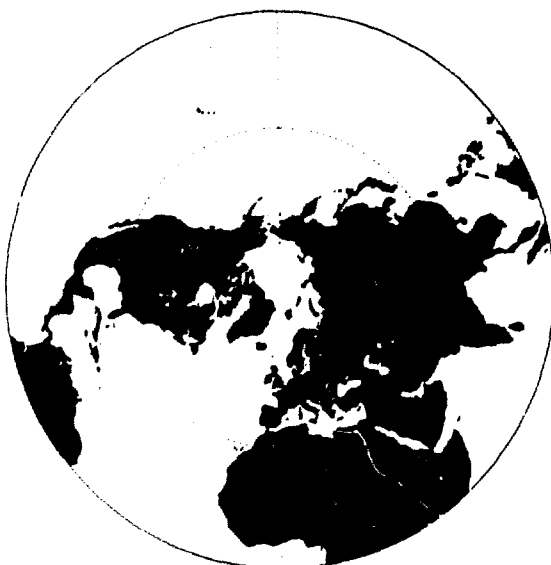
NAVAIR 50-1C-7
AWS/TR-89/007

JOINT U.S. NAVY/U.S. AIR FORCE CLIMATIC STUDY OF THE UPPER ATMOSPHERE

VOLUME 7 - JULY

JULY, 1989

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PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT
ASHEVILLE, N.C.

PREPARED UNDER THE AUTHORITY OF
COMMANDER, NAVAL OCEANOGRAPHY COMMAND
STENNIS SPACE CENTER, MS 39529-5000

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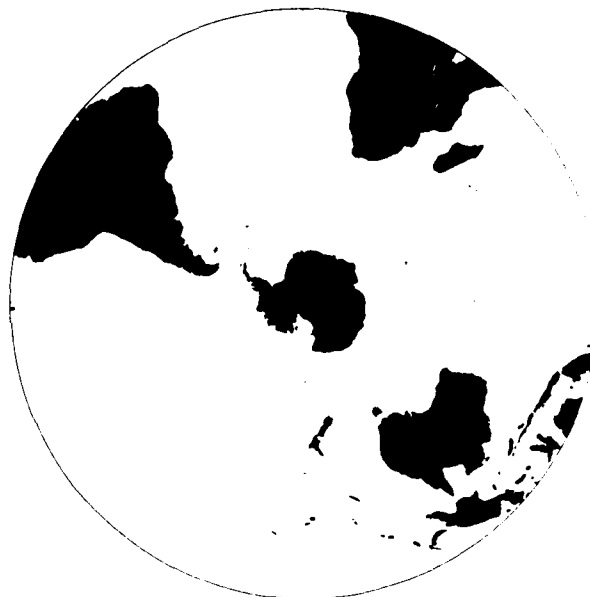


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All other editions are obsolete

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INTRODUCTION

During the past decade, improvements in the collection and assimilation of data required for more accurate representations of the atmosphere have resulted in data sets useful for developing a more definitive climatology of the global atmosphere. Such a climatology has uses in aircraft operations and planning, indirect assessments of atmospheric transport as well as a standard state from which atmospheric anomalies can be analyzed.

Prior climatologies, U.S. Navy (1959), U.S. Navy (1966), Naval Weather Service Command (1969), and Naval Weather Service Command (1970), were produced from individual station data with varying periods of record, and the resulting summarized data were analyzed. A serious deficiency was the lack of reporting locations in the major ocean basins. Analyses over the oceans were derived by extrapolating from known analyses over coastal regions as well as the few island or ocean vessels available. An additional complication was the manually intensive effort required to ensure horizontal and vertical consistency of the data.

With the advent, in the 1970s, of more powerful computers and data collection and assimilation systems, the initial analyses used for input into forecast models had a three-fold advantage over the station analyses utilized in the prior climatologies. First, the data assimilation system utilized a greater variety of information for production of an analysis. The normal array of land-based upper air reporting stations was supplemented by ship-based reporting stations, cloud reports, pilot reports and, most importantly, satellite-derived temperature, moisture and wind data. Consequent analyses more accurately represented the state of the atmosphere at a given observation time. Second, the assimilation system quality-controlled all incoming data and ensured the horizontal and vertical consistency of the resulting analyses. Finally, through the computer-based system, global data were available and archived in grid-point form.

A number of analysis sets produced by various national and international meteorological services were investigated. It is recognized that improvements to the data assimilation and analysis systems occurred within any analysis set produced, and that current analyses more accurately reflect the atmosphere's state than do the earlier analyses. It is also recognized that specific parameter or geographic-based deficiencies exist in all analysis sets. However, the intent of this upper-air climatology effort is the production of analyses to serve the needs of the operational meteorologist. A climatology derived from global analyses achieves this goal. Based on known capabilities and technical reviews of the various systems, as well as recommendations from the professional numerical modeling community, the analyses produced by the European Centre for Medium-range Forecasts were selected for processing.

ECMWF DATA

The European Centre for Medium-range Weather Forecasts (ECMWF) is an international organization established in 1973 and supported by 17 member states. It is responsible for providing global forecasts to the European community. Their data assimilation system consists of multivariate optimal interpolation analysis allowing the incorporation of a variety of observations with differing error characteristics and spatial distributions. A relatively comprehensive coverage of global data is ensured through the data collection schedule. A unique feature of the ECMWF system is the method of grid point analysis. Rather than analyzing individual grid points, varying sized boxes (depending on data density) are created containing groups of grid points. Grid point analysis uses data from within the box as well as adjacent boxes, thereby assuring a consistent analysis between all the grid points.

The system also includes internal quality control which examines the climatological reasonability of incoming data as well as the internal consistency of the data.

In addition, the system utilizes a model initialization process which ensures that harmful gravity waves, caused by imbalances in the analysis, with the potential to create problems in subsequent forecast fields, are suppressed. Through the initialization process, the atmosphere's mass and wind fields are adjusted so that only a portion of the gravity wave balanced by dynamic and physical processes is retained. Further information on the ECMWF system is available in Lorenc (1981), Shaw, et al. (1984), Lonnberg, et al. (1986), and ECMWF (1988).

The resulting initialized analyses are vertically interpolated to these 13 standard pressure levels: 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, and 30 mb, and include the geopotential height, temperature, and wind for all levels with moisture included for the 1000 through 300 mb levels.

Six years (1980-1985) of individual analysis were obtained from ECMWF on a 2.5° global grid. Although the analyses were permanently archived as spherical harmonic coefficients, ECMWF reconstituted the analyses for use in the data processing. Synoptic analyses at six-hour intervals were received for the six-year period, but only the 00 and 12Z analyses were re-sorted into a grid point sort. Given the quality control performed by ECMWF on collected data and the requirements for horizontal and vertical data consistency imposed by the assimilation system, minimal quality control was performed prior to summarization. Primary quality control was limited to comparison of level data against known/estimated climatological extremes.

The summarized grid point data were objectively analyzed, machine-contoured by parameter and level on polar stereographic (0°-90°N and S) and cylindrical equidistant (0°-60°N and S) projections with resulting contours machine-labeled. In addition, individual wind observations were consolidated into eight 45° segments centered on directions north, northeast, through northwest for display as wind roses on a series of cylindrical equidistant projections.

Since the ECMWF analyses were archived as spectral harmonic coefficients, the grid point reconstitution process provides data for all global 2.5° grid points. This naturally includes (for the 1000 through 700 mb levels) selected grid points at which the land elevations exceed the height of the pressure surface. For these grid points, a blanking program was used to eliminate both contours and grid point wind roses.

ANALYSES

1. Pressure-Height

Grid point geopotential height values (in dekameters) are summarized by month for 13 levels from 1000 mb to 30 mb with solid and dashed contours of mean values presented on pressure height charts. Standard deviation of height is calculated from the individual daily values with contours presented on a separate chart series including the standard deviation of vector mean wind. Local points of highest and lowest pressure are designated with H's and L's on the analyzed charts. Not all pressure centers are enclosed by closed contours. Vector mean wind in 5-knot increments are calculated for selected grid points considered adequate to depict flow for the hemisphere with wind shaft orientation related to specific latitude/longitude lines. Vector mean winds less than 2.5 knots are depicted as a shaft with no barbs. Contours of mean geopotential height and vector mean wind barbs are presented for the northern/southern hemispheres on polar stereographic projection and for 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

2. Wind Roses

Wind roses for 10° grid points from 5° to 85° north and south are presented by month for all levels from 1000 mb to 30 mb. Each hemisphere is divided into three longitudinal zones: 60°W to 60°E, 60°E to 180°E, and 180°W to 60°W. Each rose presents:

- a) Scalar mean speed
- b) Percent frequency of occurrence from each of 8 cardinal point wind directions proportional to shaft length with dots on the shafts representing 5 percentile intervals.
- c) Mean speed for each of the 8 cardinal wind directions rounded to the nearest 5 knots.

Roses for grid points on the 1000 mb through 700 mb level charts are blanked whenever the land elevation exceeds the mean geopotential height of the specified level.

3. Temperature

Grid point temperature data (in °C) are summarized by month for 13 levels from 1000 mb to 30 mb with solid and dashed contours of mean values presented on pressure height charts. Temperature standard deviation derived from the individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

4. Dew Point

Grid point moisture data were received as mixing ratios for the period through April 19, 1982 and as relative humidity thereafter for the 1000 through 300 mb levels. All moisture data were converted to dew point values. These are summarized by month with solid and dashed contours of mean values presented on pressure height charts. Dew point standard deviation derived from the individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

5. Density

Grid point density data were computed from the daily values of temperature and pressure from the equation of state in the form

$$\rho = \frac{P}{RT}$$

where ρ is the density, P is the pressure, T is the temperature, and R is the gas constant. Density was computed for moist air through 300 mb and for dry air from 250 mb to 30 mb. Density data (in Kg/m^3) are summarized by month for all 13 levels with solid and dashed contours of mean values presented on pressure height charts. Density standard deviation derived from individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

6. Standard Deviation of Height and Vector Mean Wind

Standard deviation of the height and vector mean wind data presented on the pressure height charts are presented on monthly charts for the 1000 through 30 mb levels. Height standard deviations (in dekameters) are presented as solid contours and vector wind standard deviations (in knots) as dashed contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

7. Jet Stream

Grid point scalar mean wind speed (in knots), as presented by the value in the center of the wind rose octagons, are summarized by month and analyzed for 500 through 30 mb. All speeds exceeding 50 knots are shaded with shading intensity increasing by 25-knot increments. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections.

DATA AVAILABILITY

Monthly summarized grid point data for the period of record for all levels from 1000 through 30 mb have been retained on magnetic tape. Data available, per level, include:

- Number of observations
- Mean zonal wind component and standard deviation
- Mean meridional wind component and standard deviation
- Vector mean wind and standard deviation
- Mean temperature and standard deviation
- Mean dew point (through 300 mb) and standard deviation
- Mean geopotential height and standard deviation
- Mean density and standard deviation
- Mean scalar wind speed and percentage of observations for each designated direction

Similarly summarized data for each half-month of the 1980-85 period are also available on magnetic tape. Summaries can be provided on magnetic media or in listing form by the National Climatic Data Center.

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Lorenc, A.C., 1981: A global three-dimensional multivariate statistical interpretation scheme. Monthly Weather Review, **109**, 701-721.

Lonnberg, P., J. Pailleux, and A. Hollingsworth, 1986: The new analyses system. ECMWF Technical Memorandum No. 125.

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Shaw, D.B., P. Lonnberg, and A. Hollingsworth, 1984: The 1984 revision of the ECMWF Analysis System. ECMWF Technical Memorandum, No. 92.

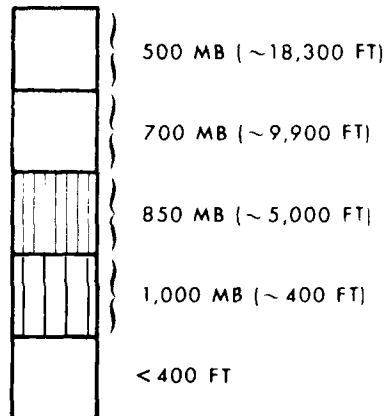
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U.S. Navy, 1966: Components of the 1000 mb Winds of the Northern Hemisphere, NAVAIR 50-1C-51.

PRESSURE - HEIGHT
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean height (solid and dashed lines) in geopotential dekameters;
example: 580 is 5800 geopotential meters; solids labeled, dashed intermediates unlabeled
- Height labeled interval:
 - 6 dekameters (60 meters) - 1000 MB to 400 MB
 - 12 dekameters (120 meters) - 300 MB to 200 MB
 - 8 dekameters (80 meters) - 150 MB to 30 MB
- Vector for mean wind in knots
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



Mean Geopotential Height (gpm)

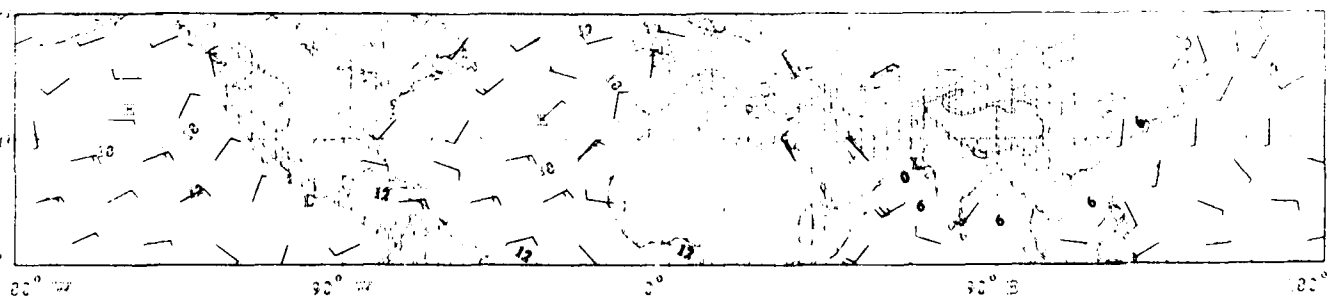
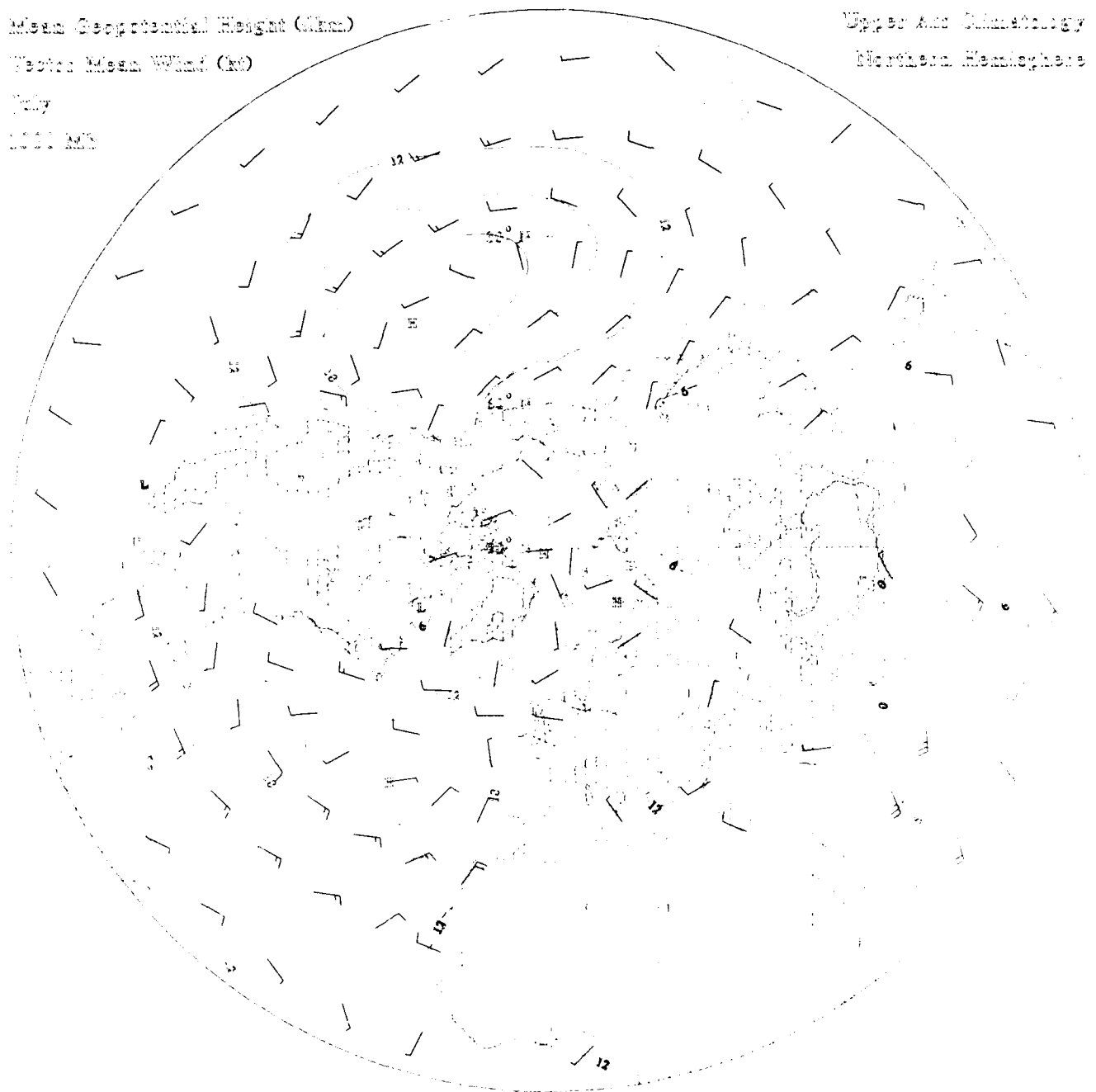
Vector Mean Wind (kt)

July

1977-78

Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (dmm)
Vector Mean Wind (m/s)

July
1971-1972

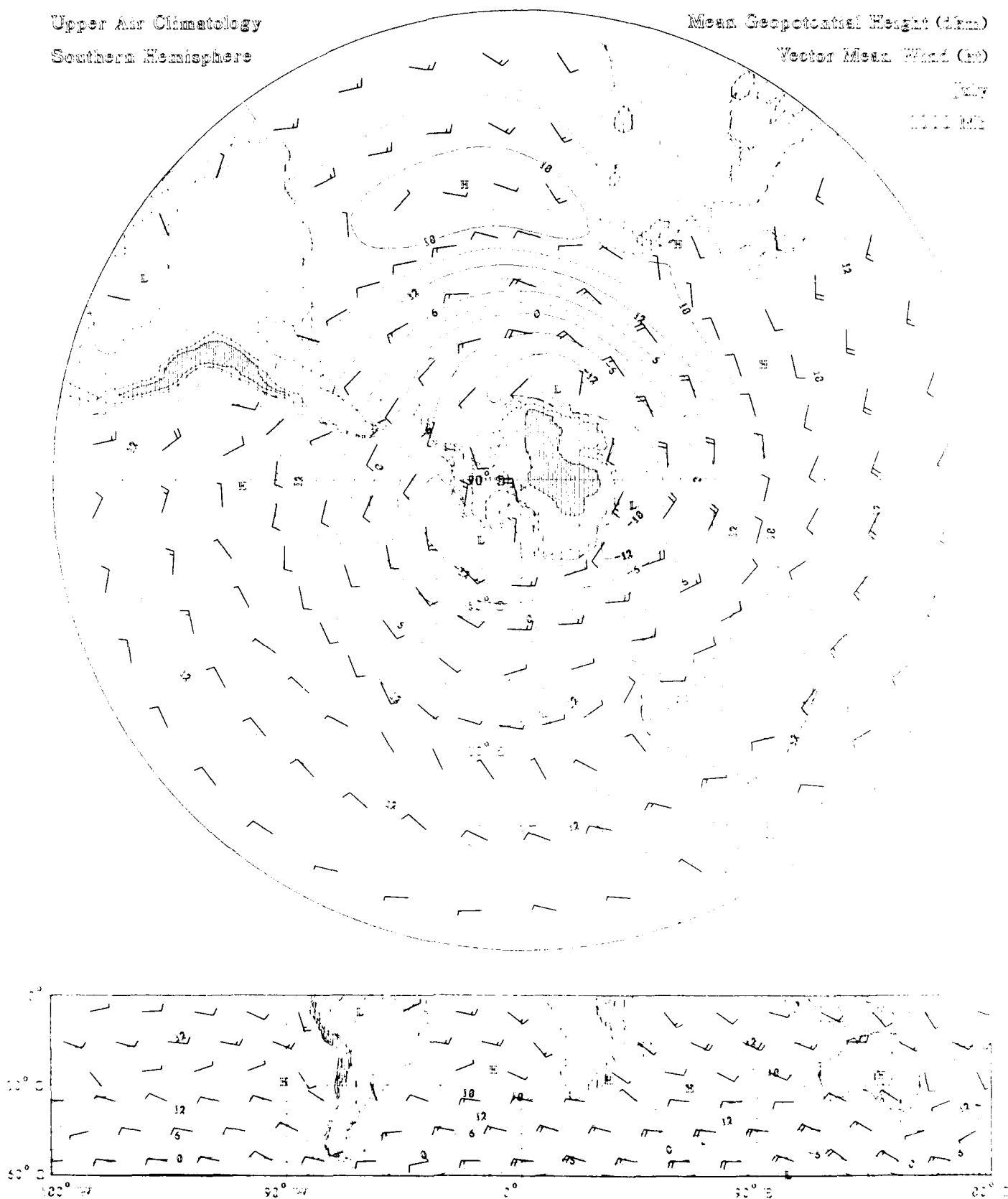
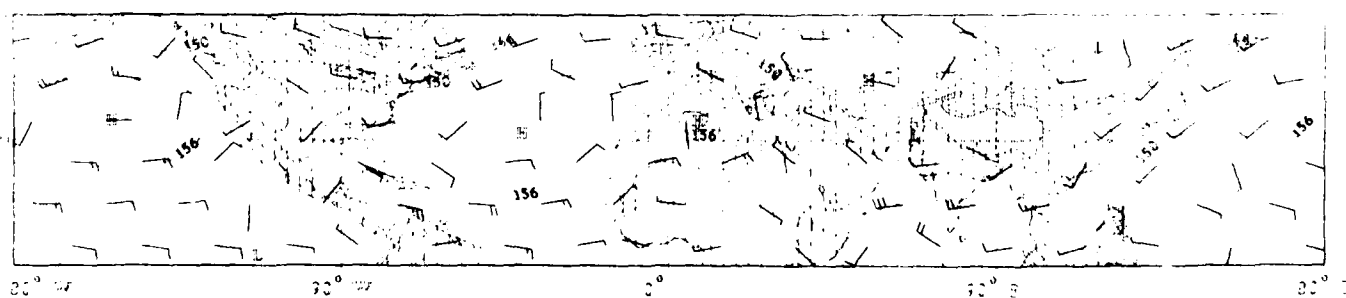
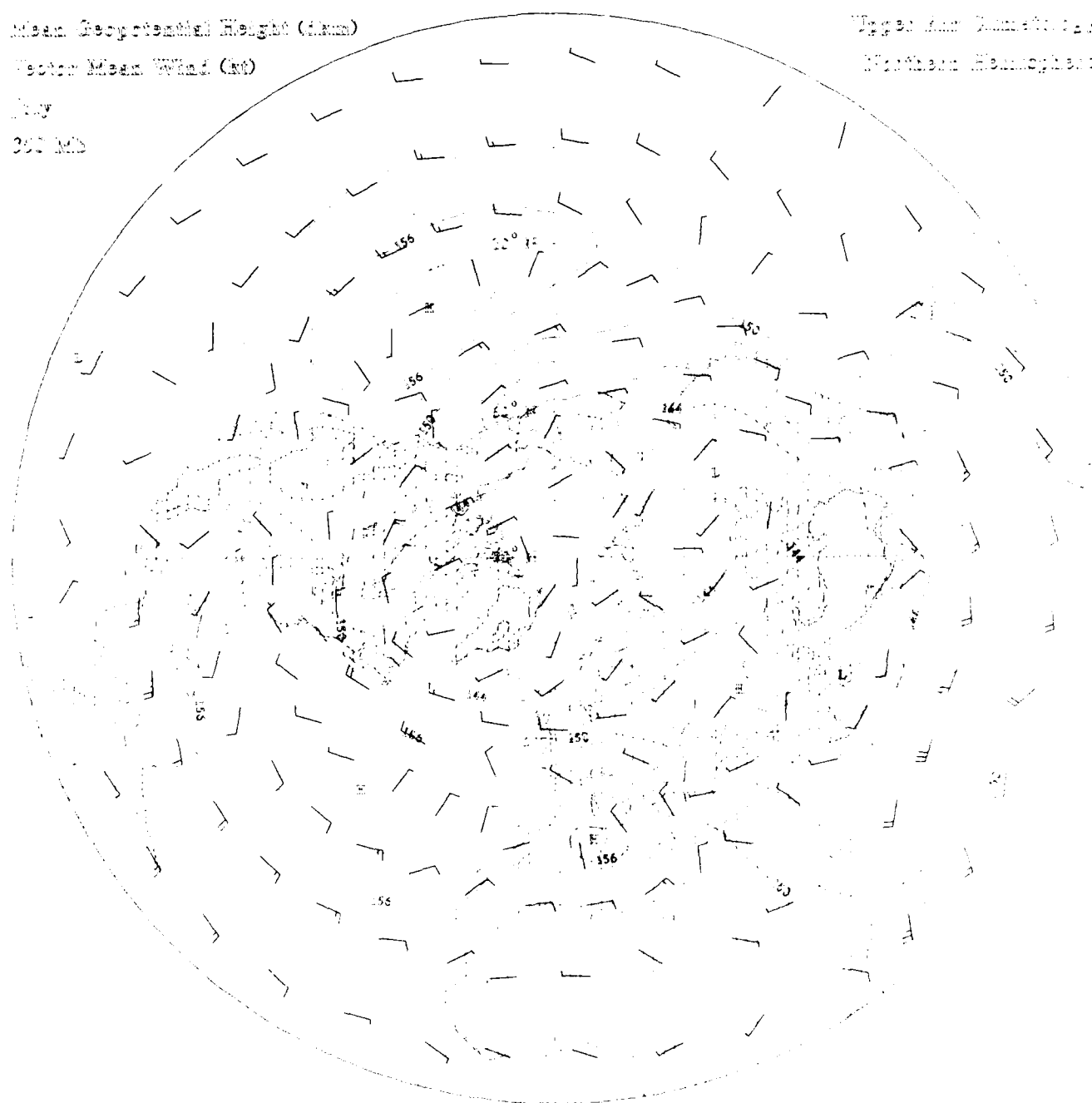


Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains.

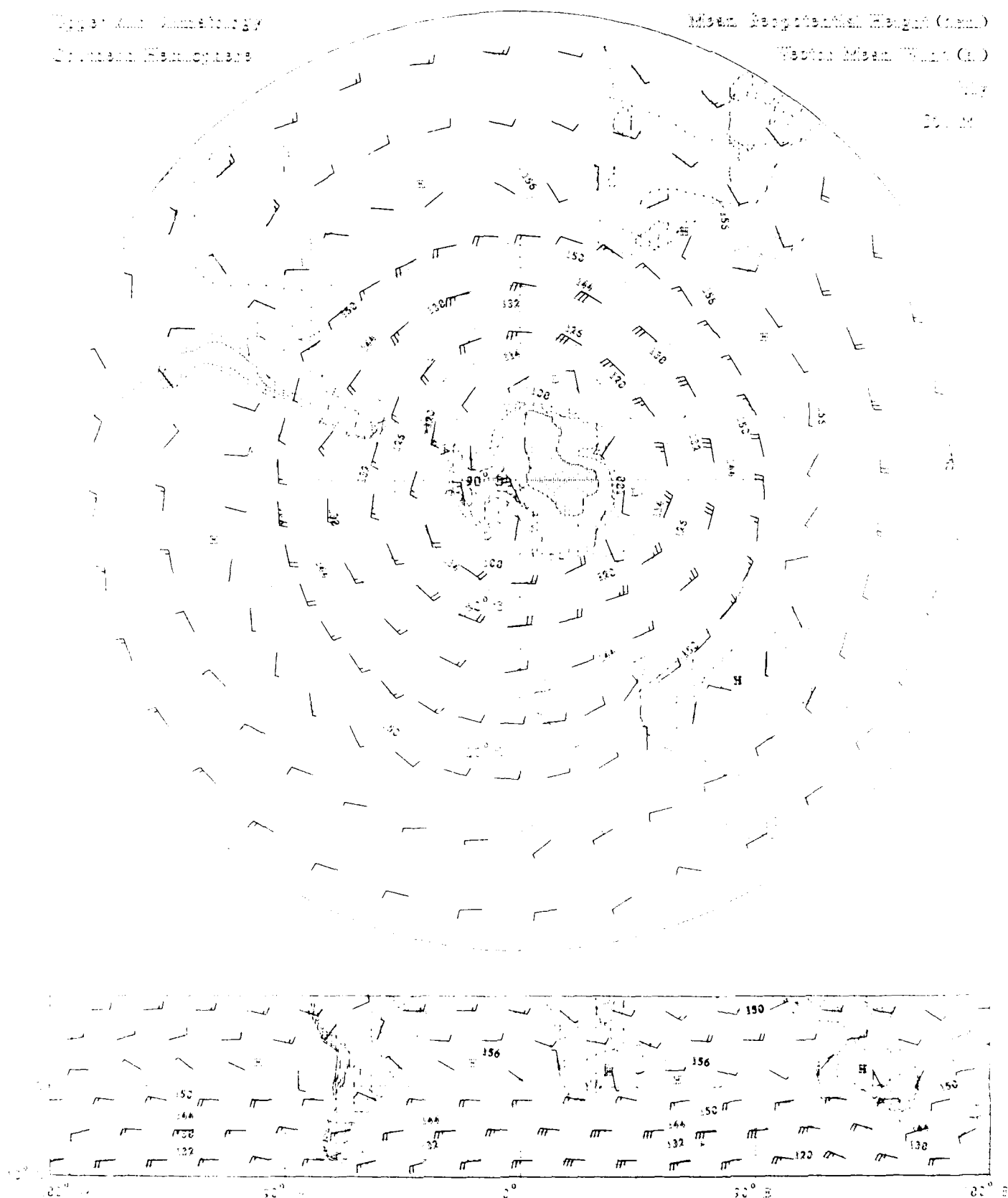
Western Hemisphere

292 MD



Upper Air Charts
 2000 mb. Height Chart

Mean Sea Level Height (mm)
 Mean Sea Level (ft)
 1000
 2000



Mean Sea Level Height (mm)

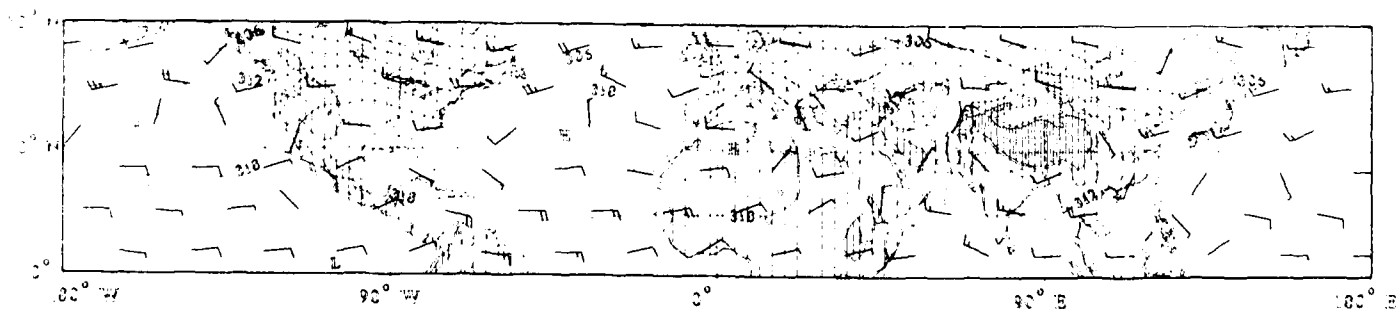
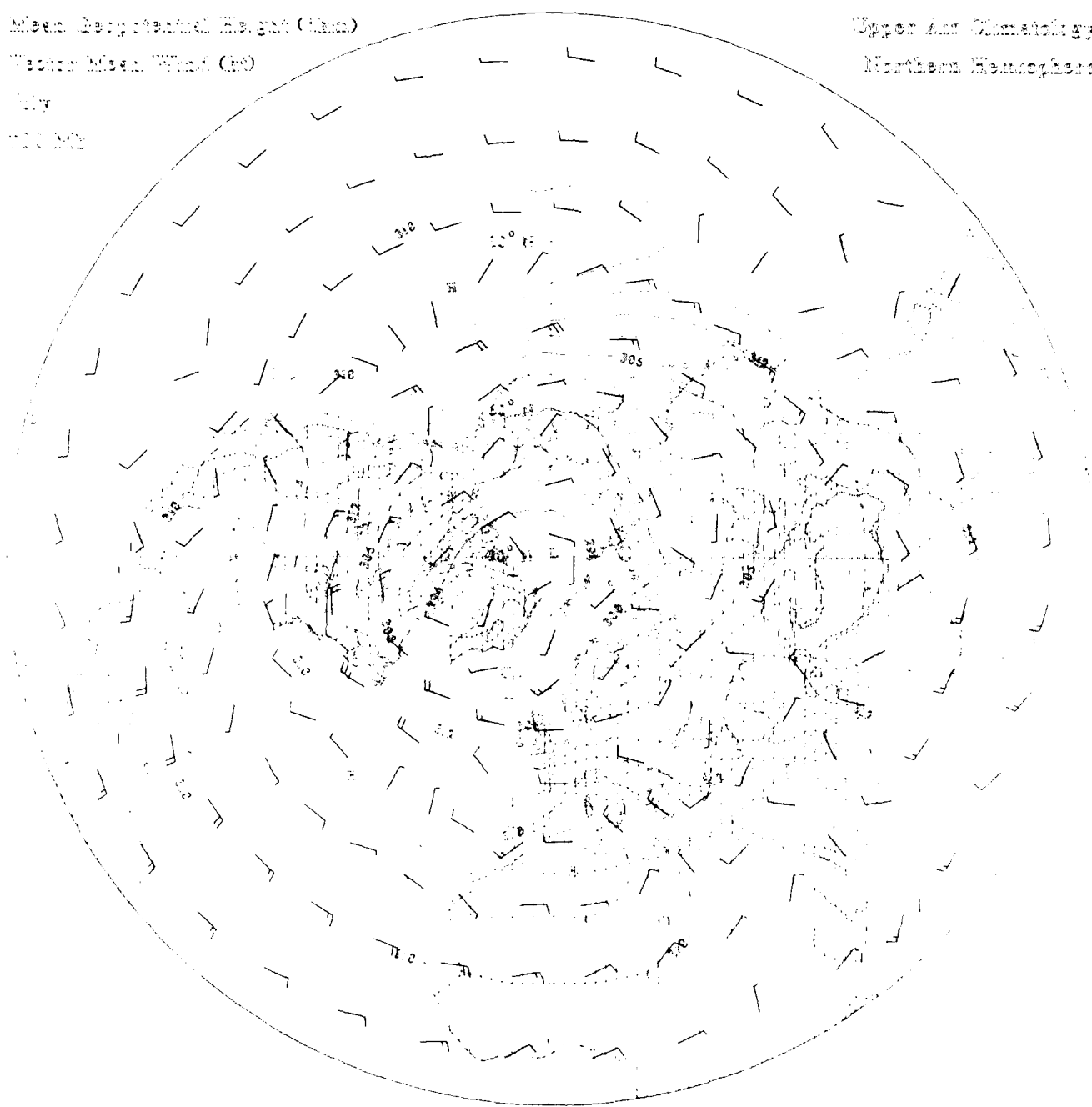
Vector Mean Wind (m/s)

July

1950-1952

Upper Air Climatology

Northern Hemisphere

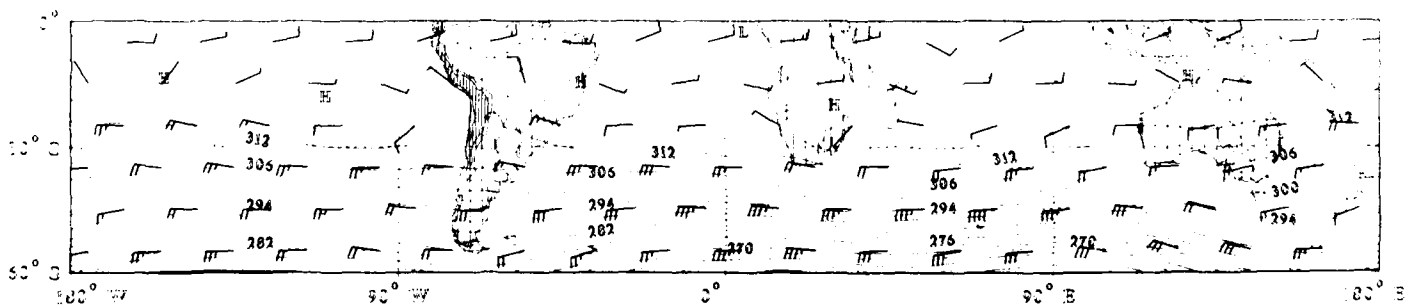
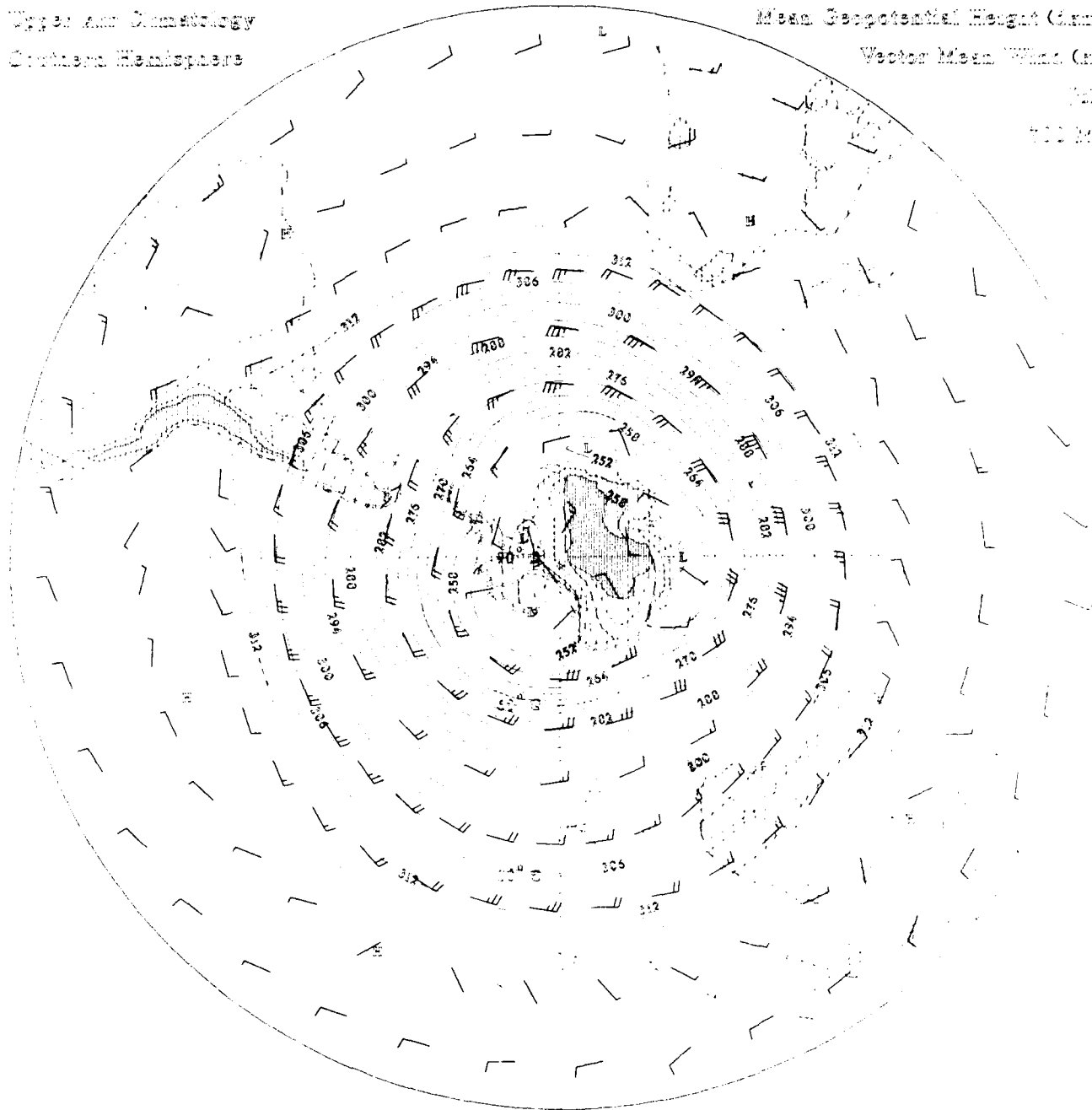


Upper Air Climatology
 Northern Hemisphere

Mean Geopotential Height (gpm)

Vector Mean Wind (m/s)

July
 1979-1980



Mean Geopotential Height (dkm)

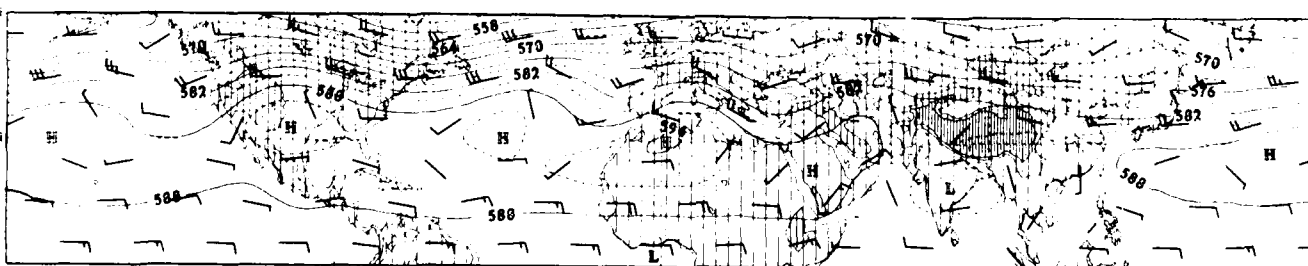
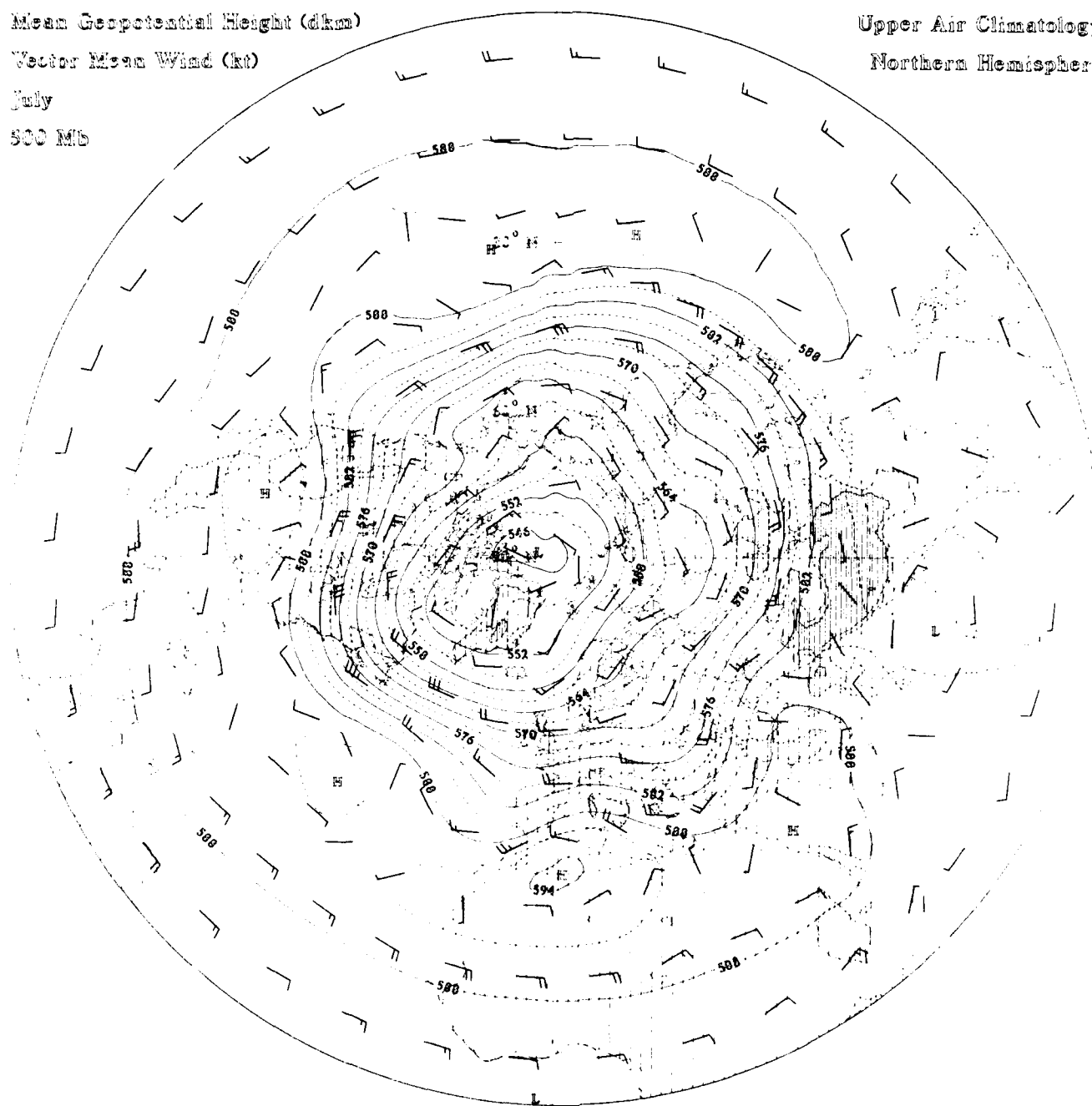
Vector Mean Wind (kt)

July

500 MB

Upper Air Climatology

Northern Hemisphere

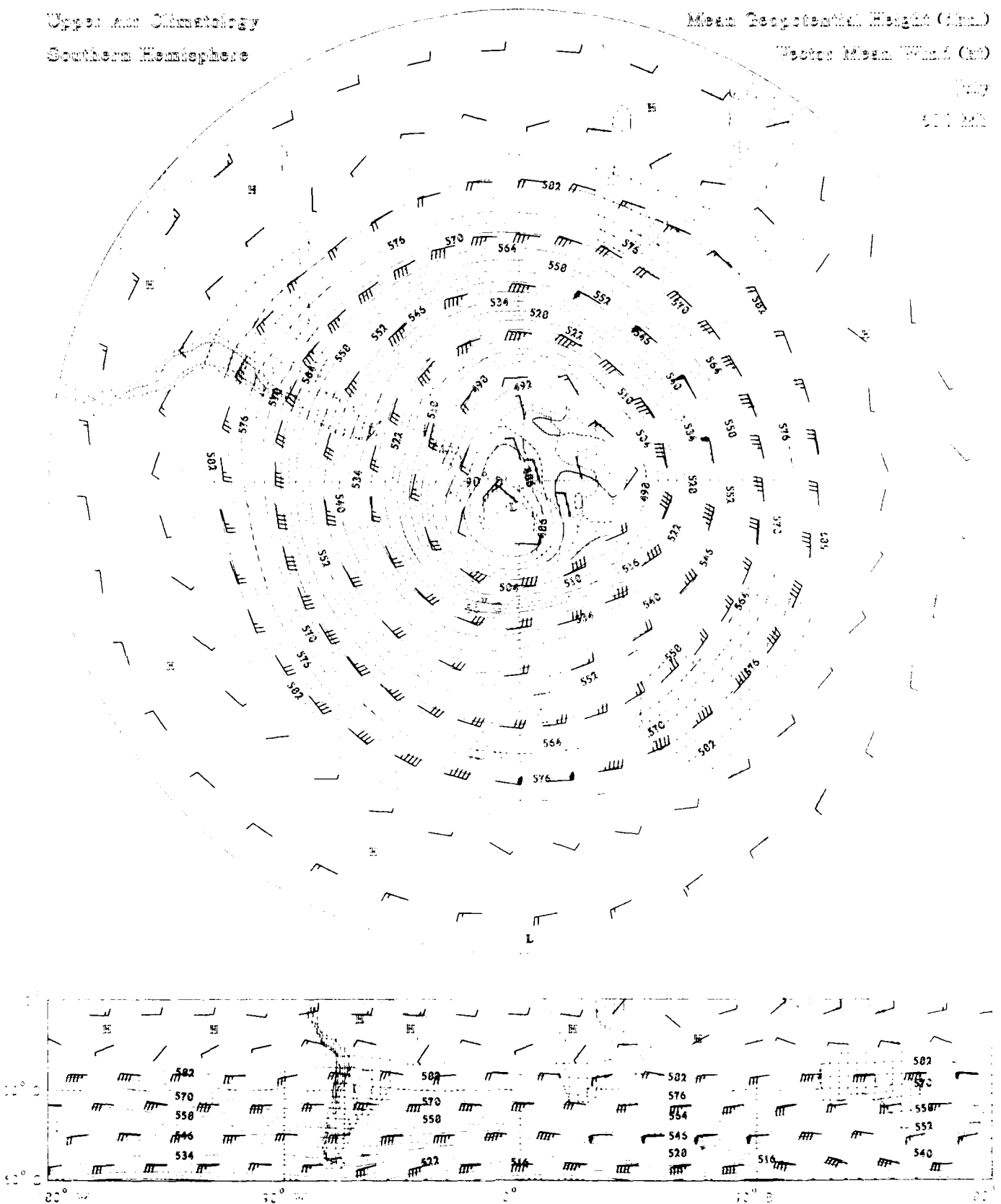


Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (gms)

Vector Mean Wind (kt)

1000
500 200



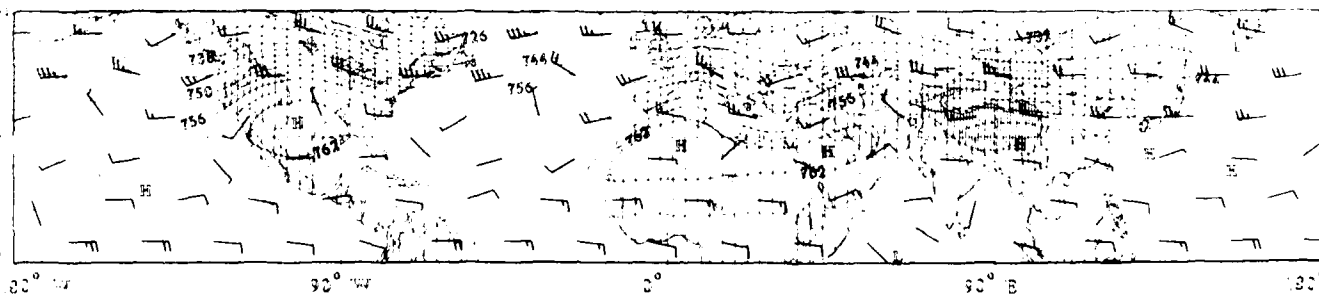
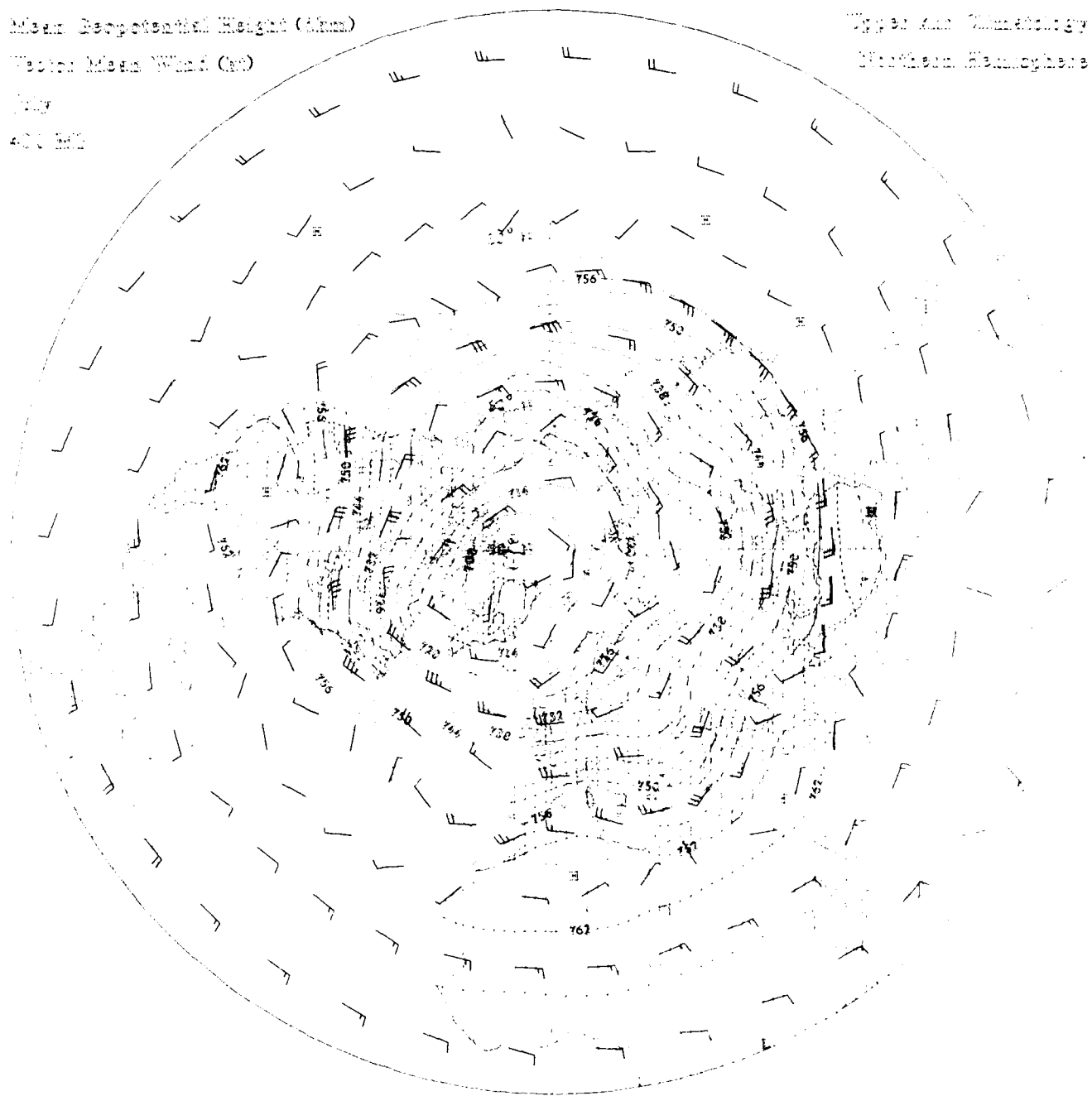
Mean Geopotential Height (dm)

Vector Mean Wind (m)

July
1961

Typical Climatology

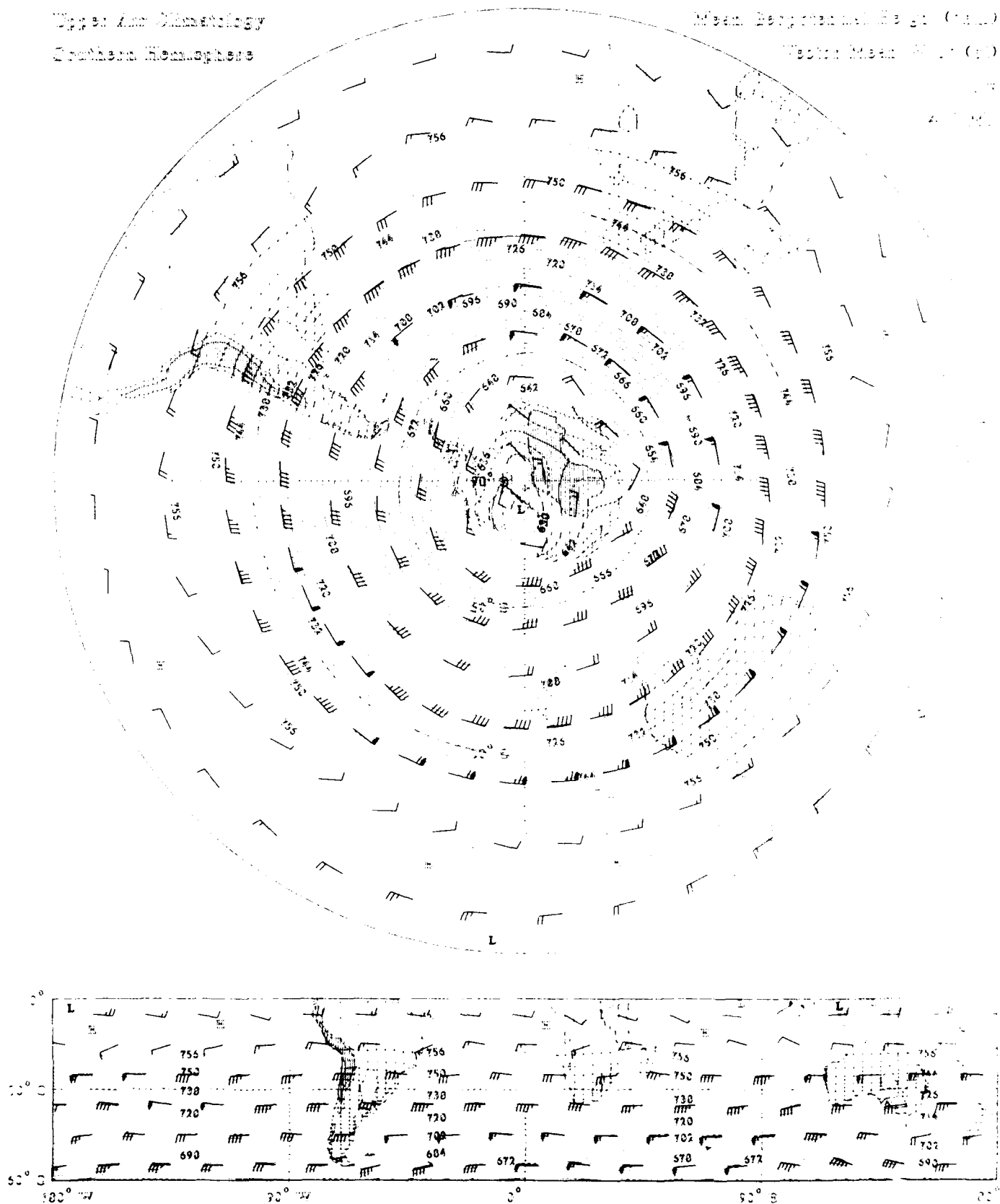
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Sea Level (msl)

Mean Sea Level (msl)



Mean Geopotential Height (dam)

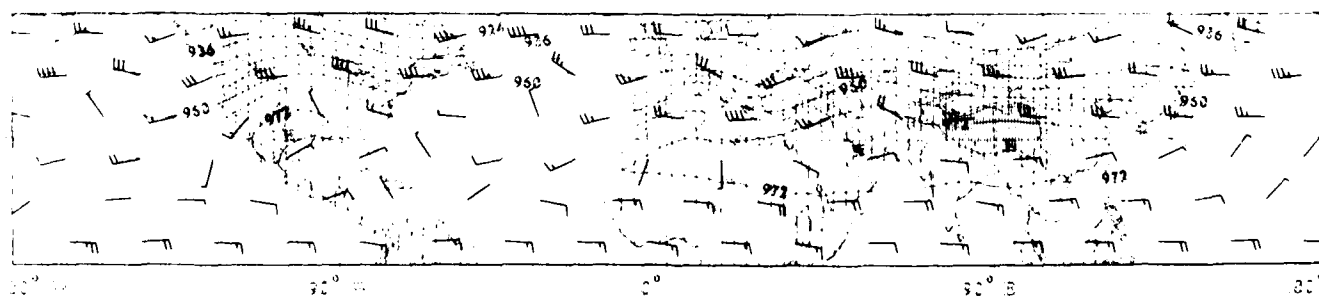
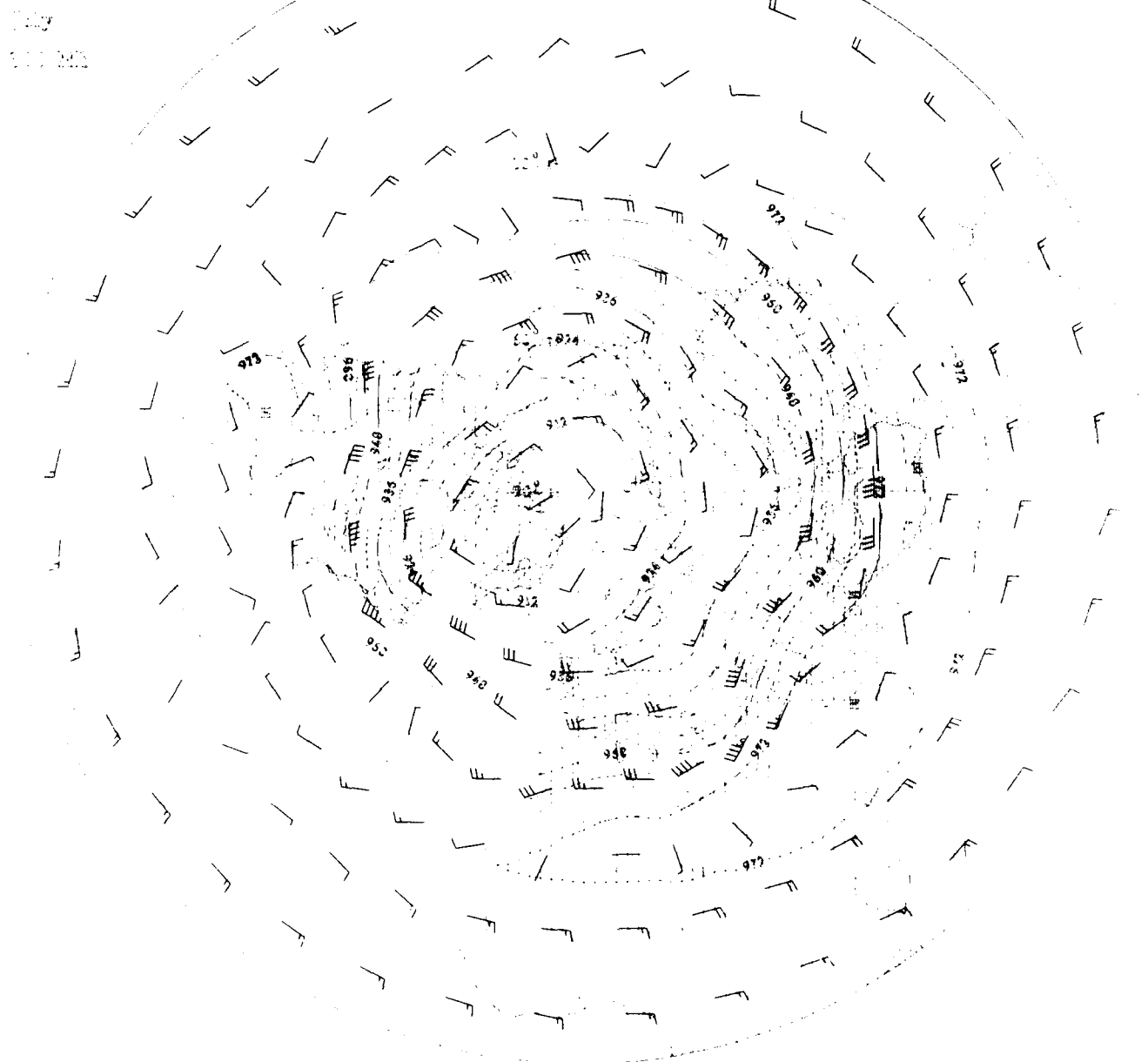
Vector Mean Wind (ms)

Day

100000

Upper Air Climatology

Northern Hemisphere



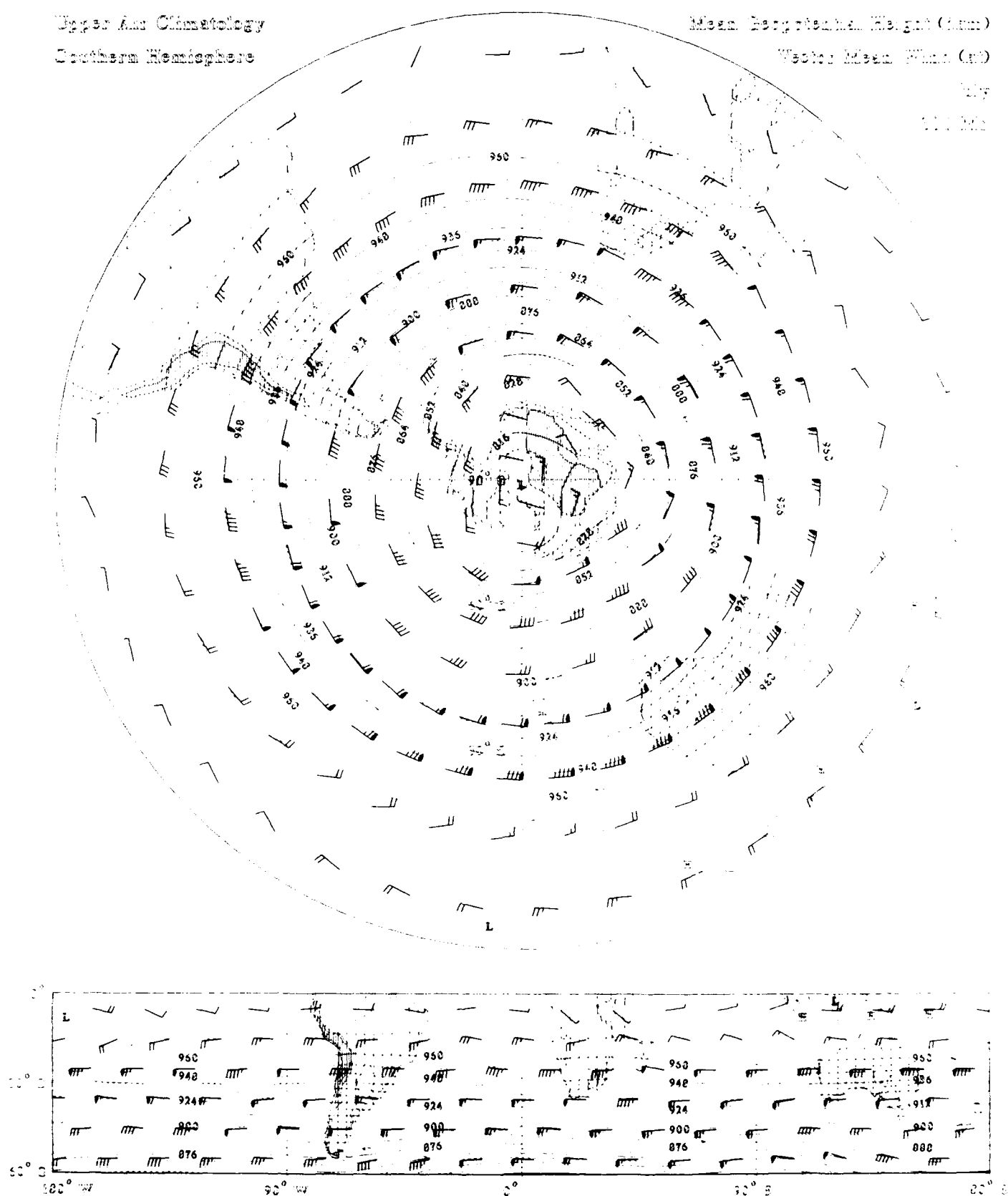
Upper Air Climatology
Southern Hemisphere

Mean Sea Level Height (mm)

Vector Mean Wind (m/s)

100

100 200



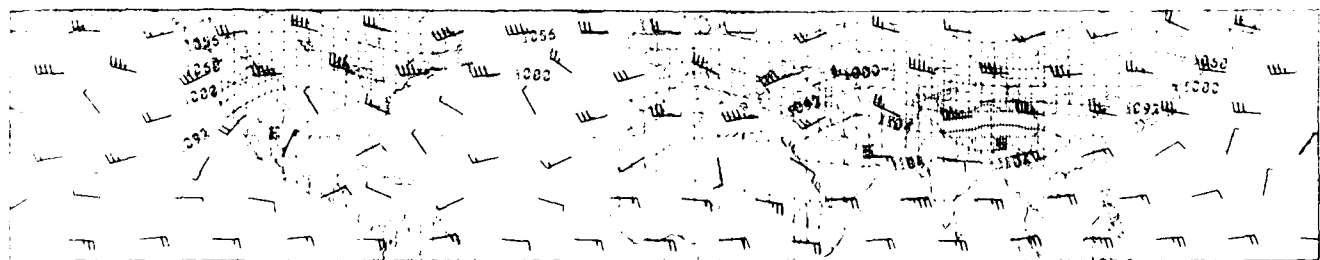
Mean Sea Level Height (ftm)

Mean Tide (ftm)

Upper Air Charting

Northern Hemisphere

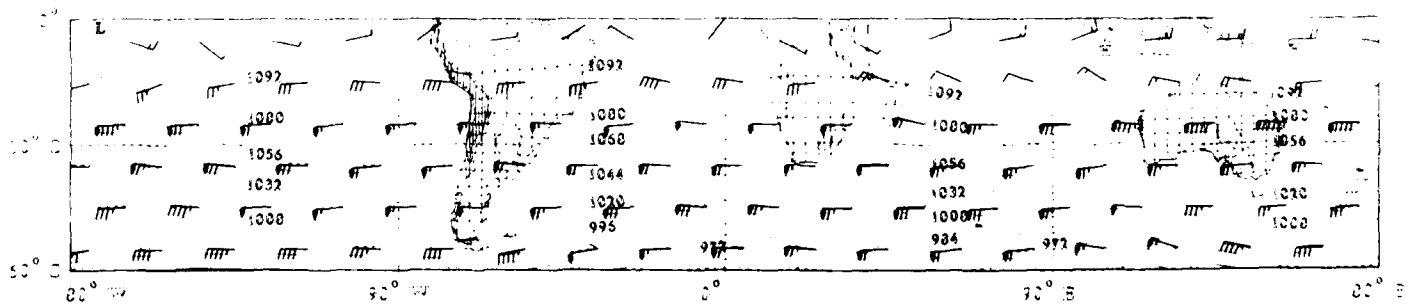
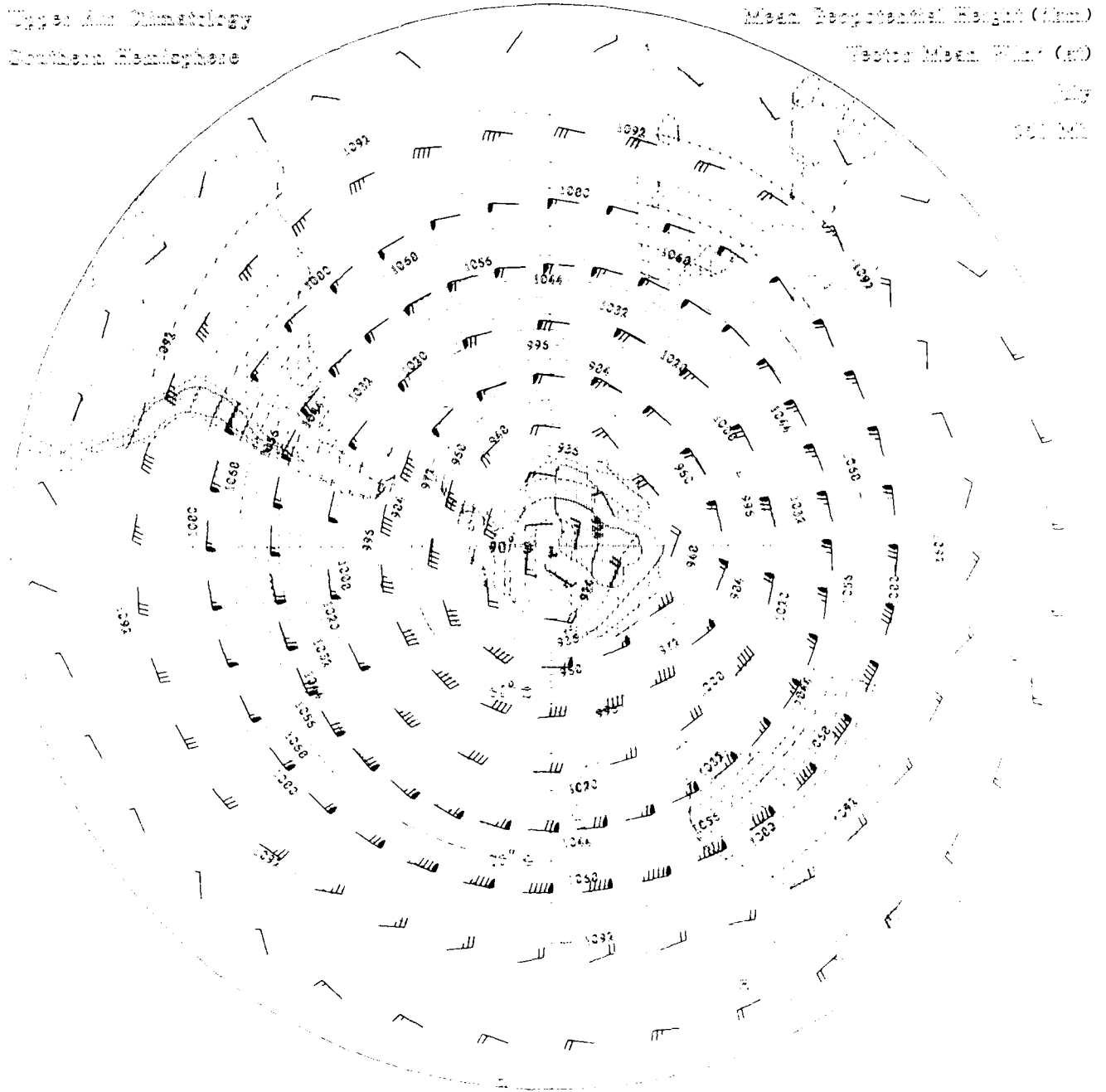
100
1000



Upper Air Climatology
Northern Hemisphere

Mean Sea Level Height (km)

Vector Mean Wind (m/s)



Mean Sea Level Height (Mm)

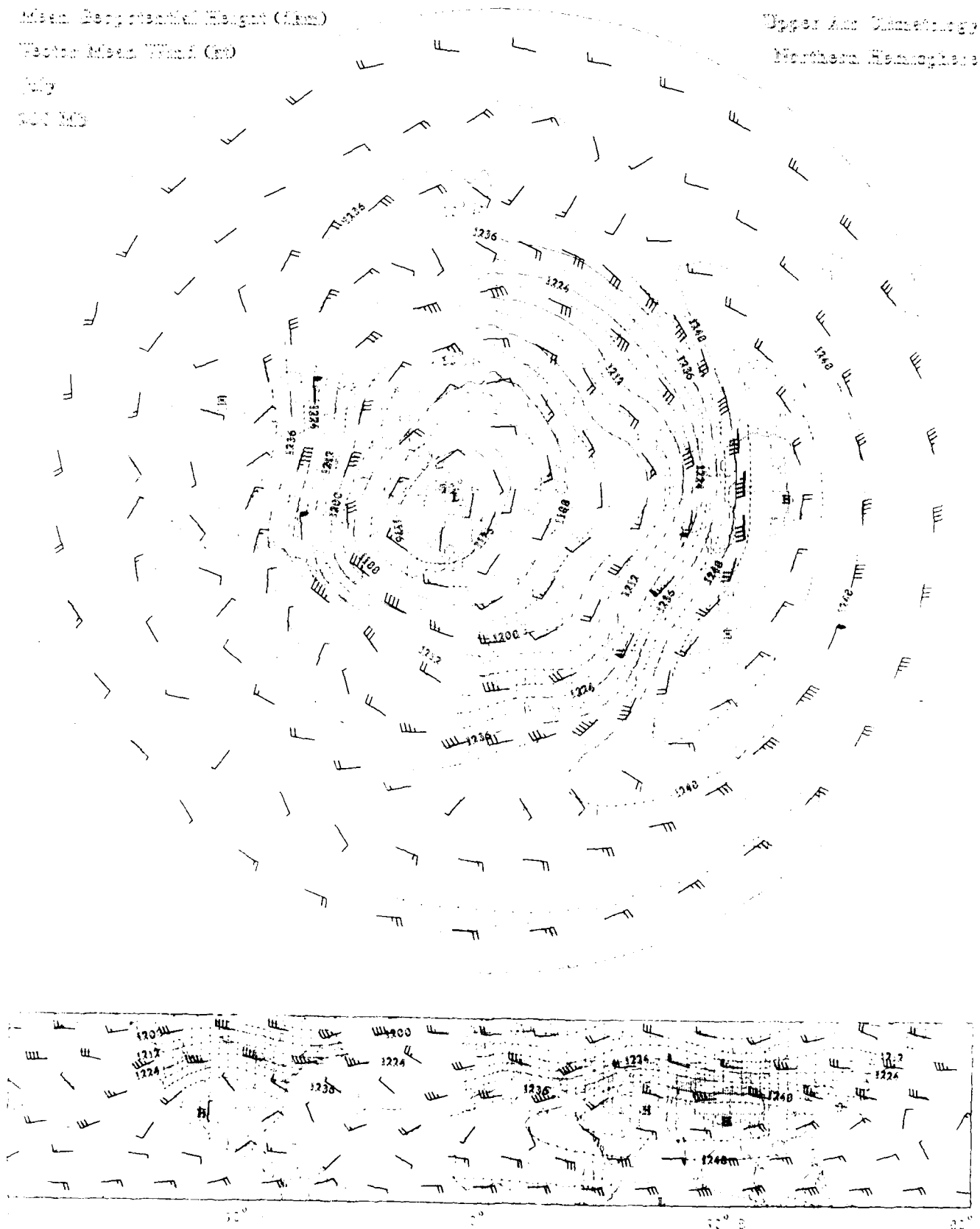
Tidal Mean Wind (m)

July

1951-52

Upper Air Chart

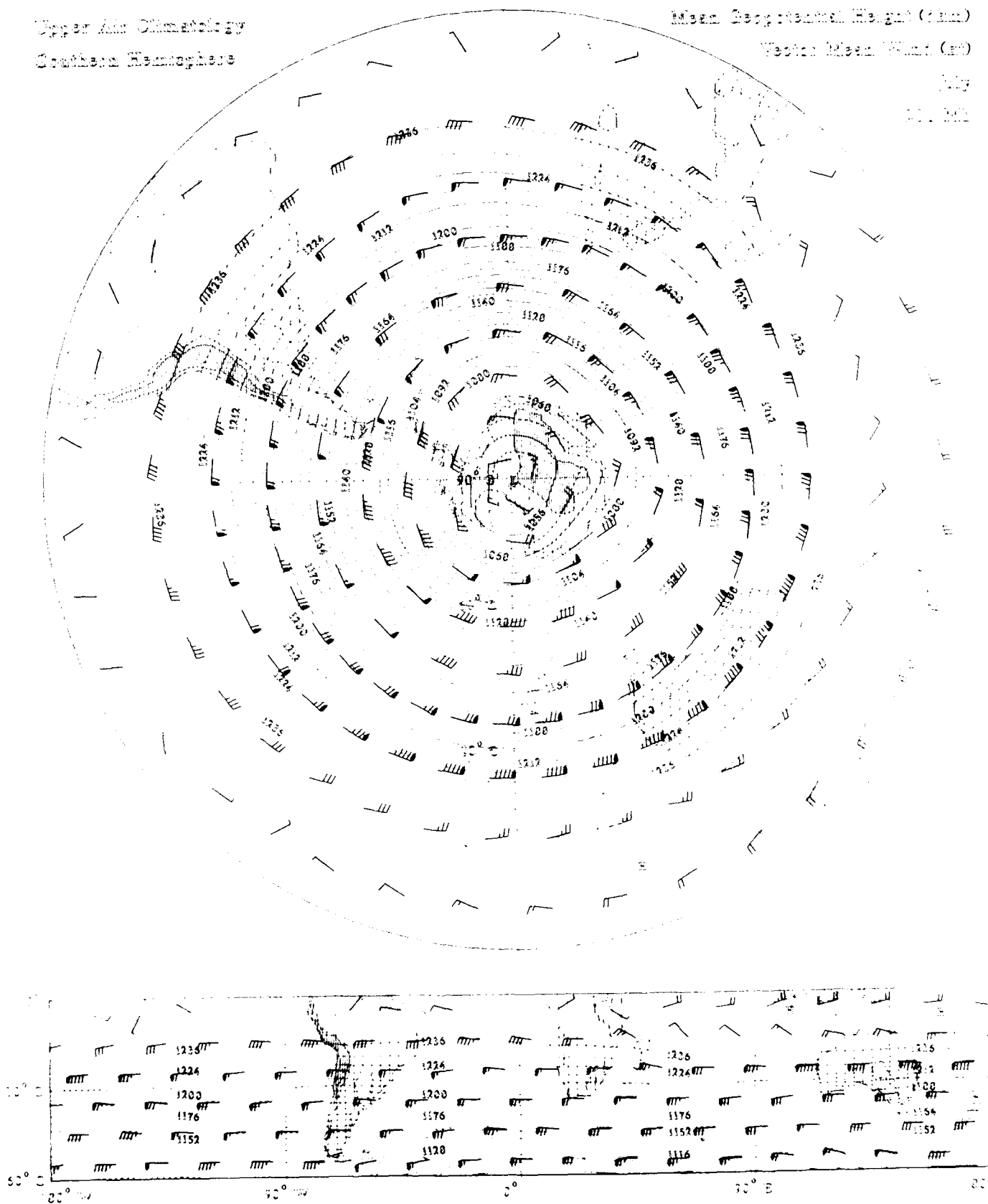
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Sea Level Height (mm)

Vector Mean Wind (m/s)



Mean Sea Level Height (mm)

Vector Mean Wind (m/s)

Fig

1910

Figure 1: Mean Sea Level Height

Figure 2: Vector Mean Wind

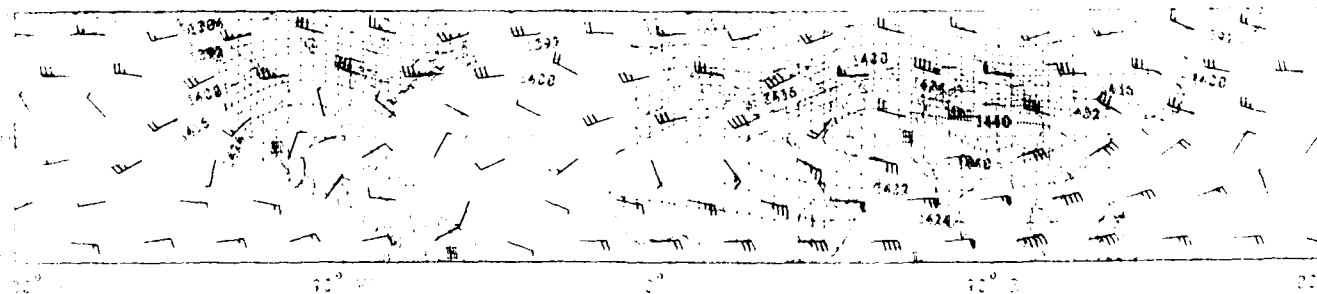
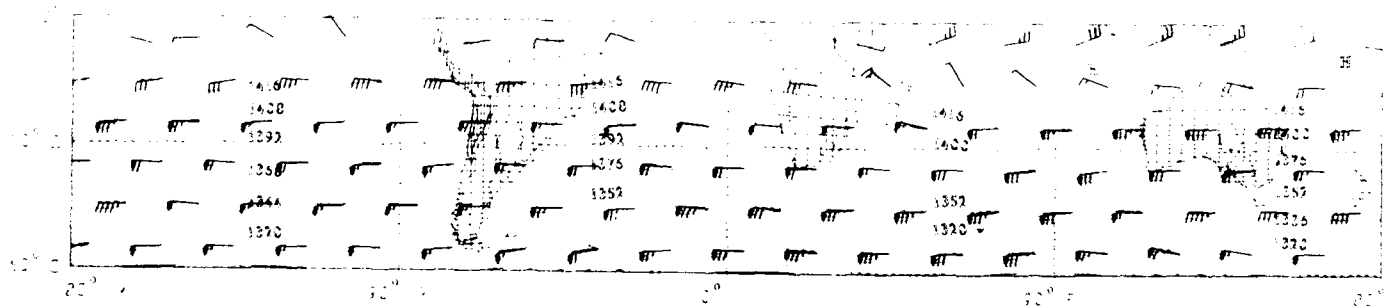
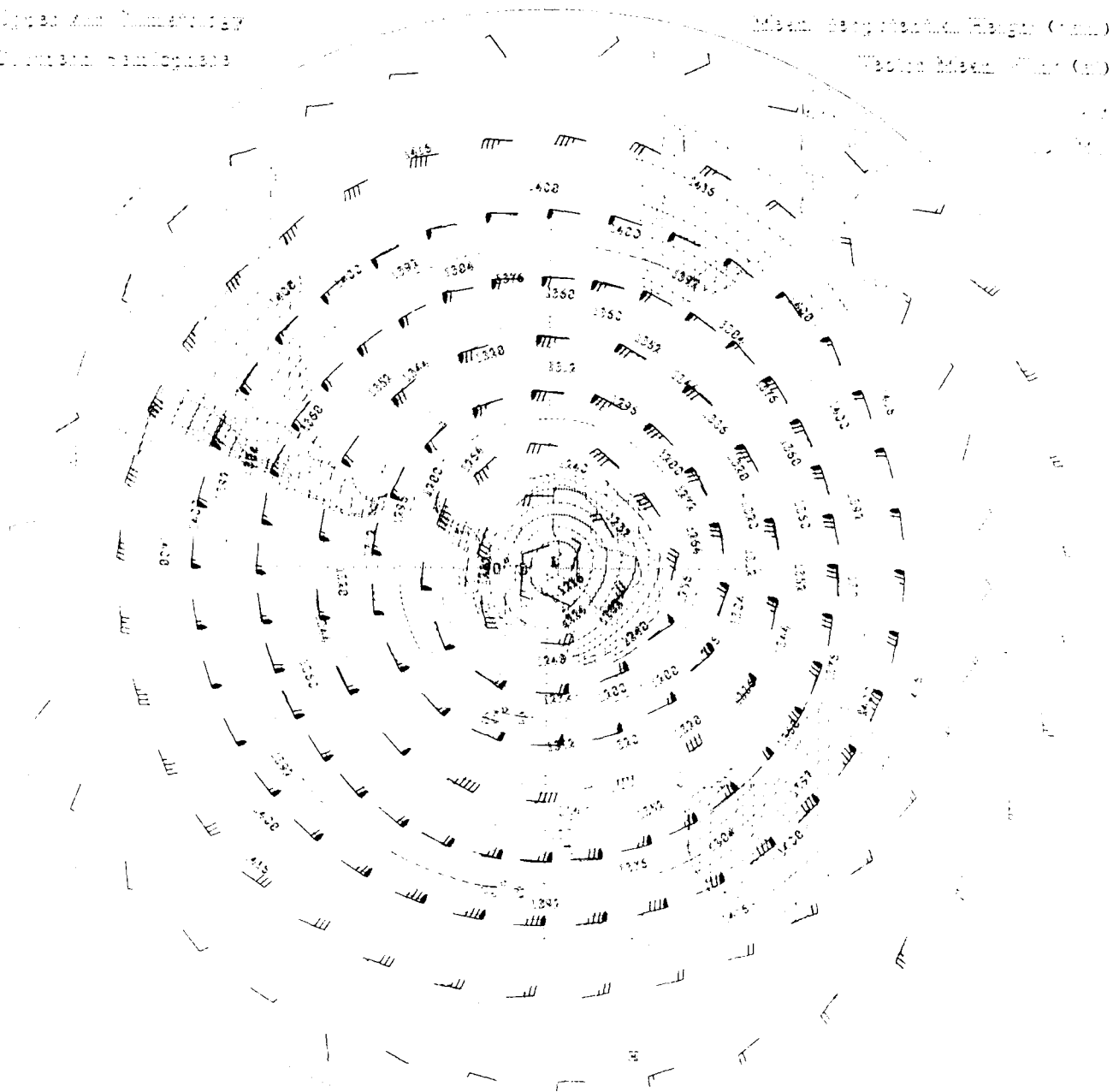


Figure 30. Ann. Transmittance
 0.001311 0.001312

Mean. Longitudinal Hanger (mm)
 0.001311 0.001312



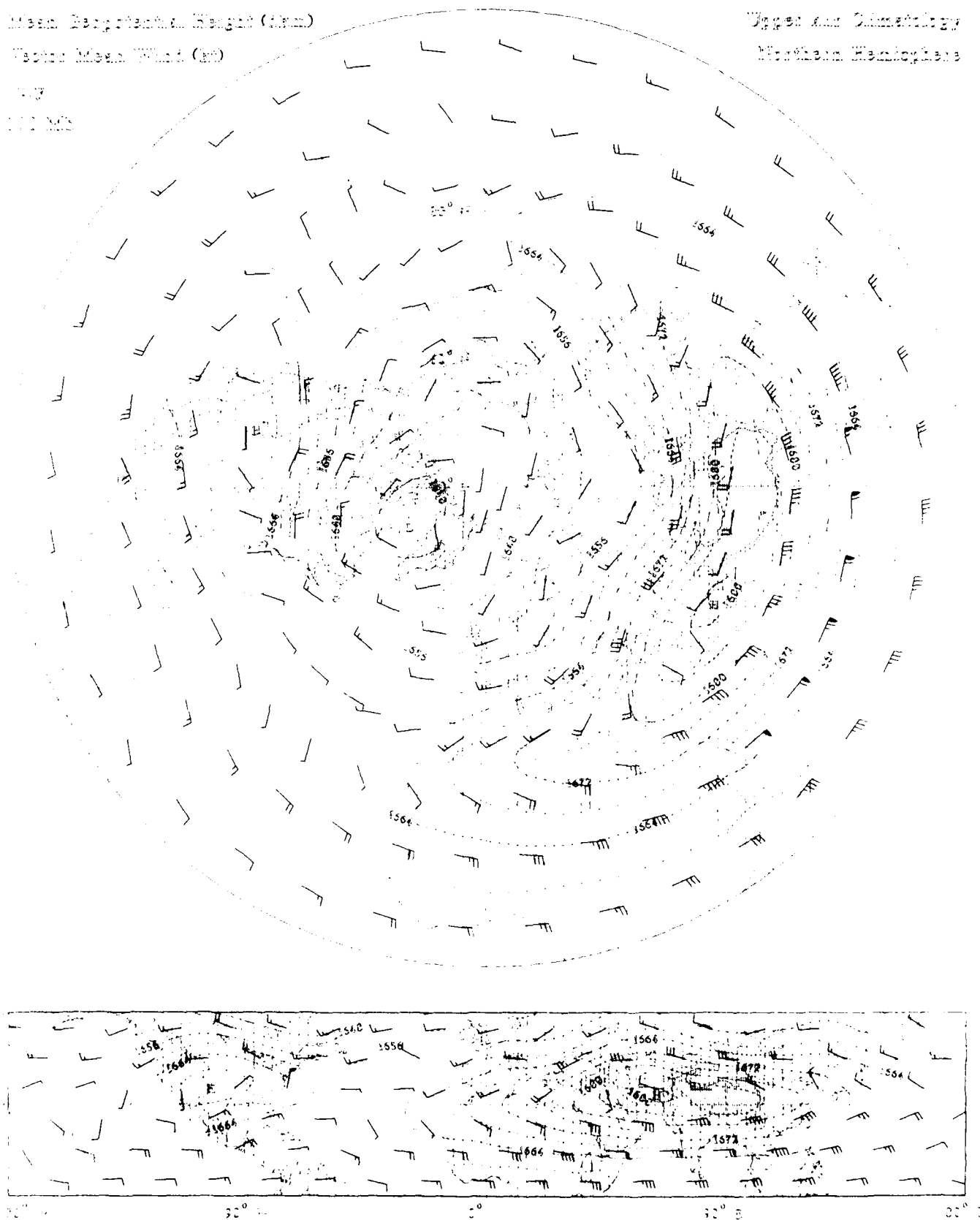
Mean Sea Level Height (ftm)

Vector Mean Wind (kt)

Upper Air Chart

Mean Sea Level

100
1000



Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (dam)

Vector Mean Wind (m)

July
100 MB

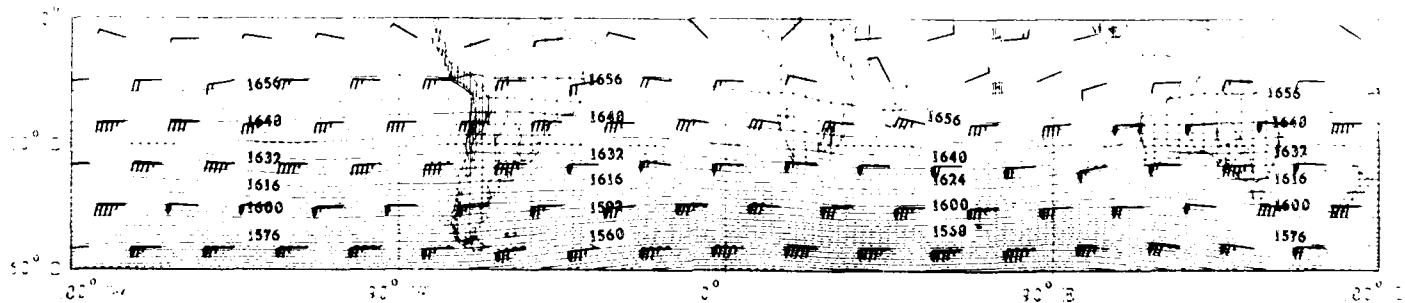
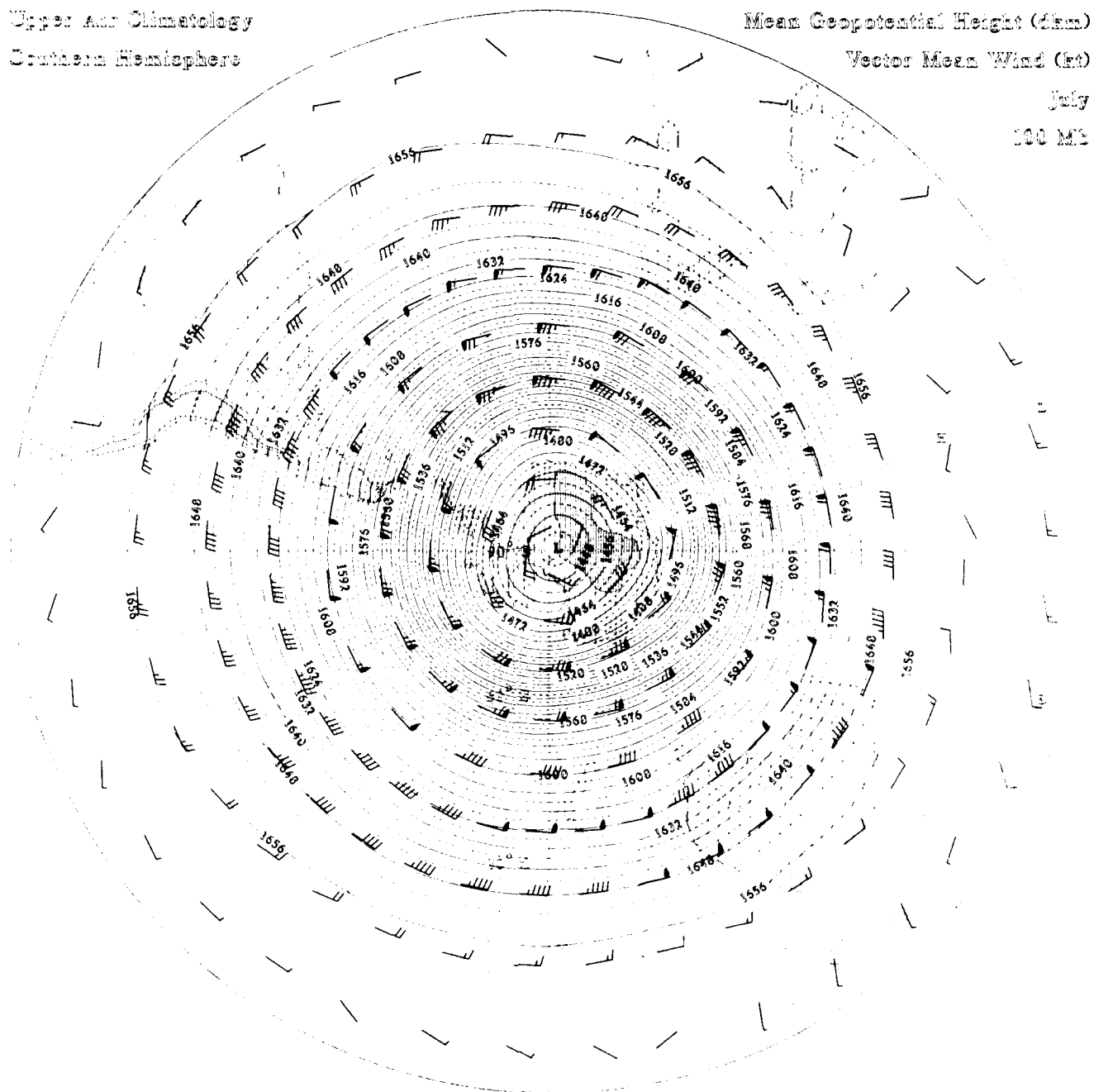
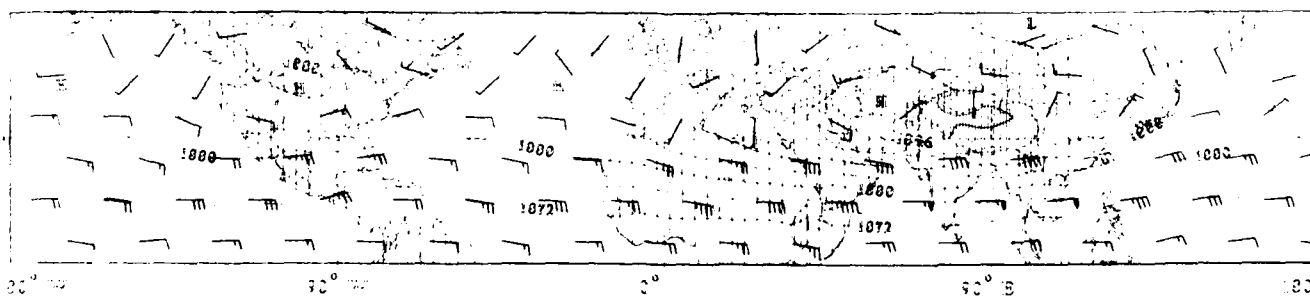
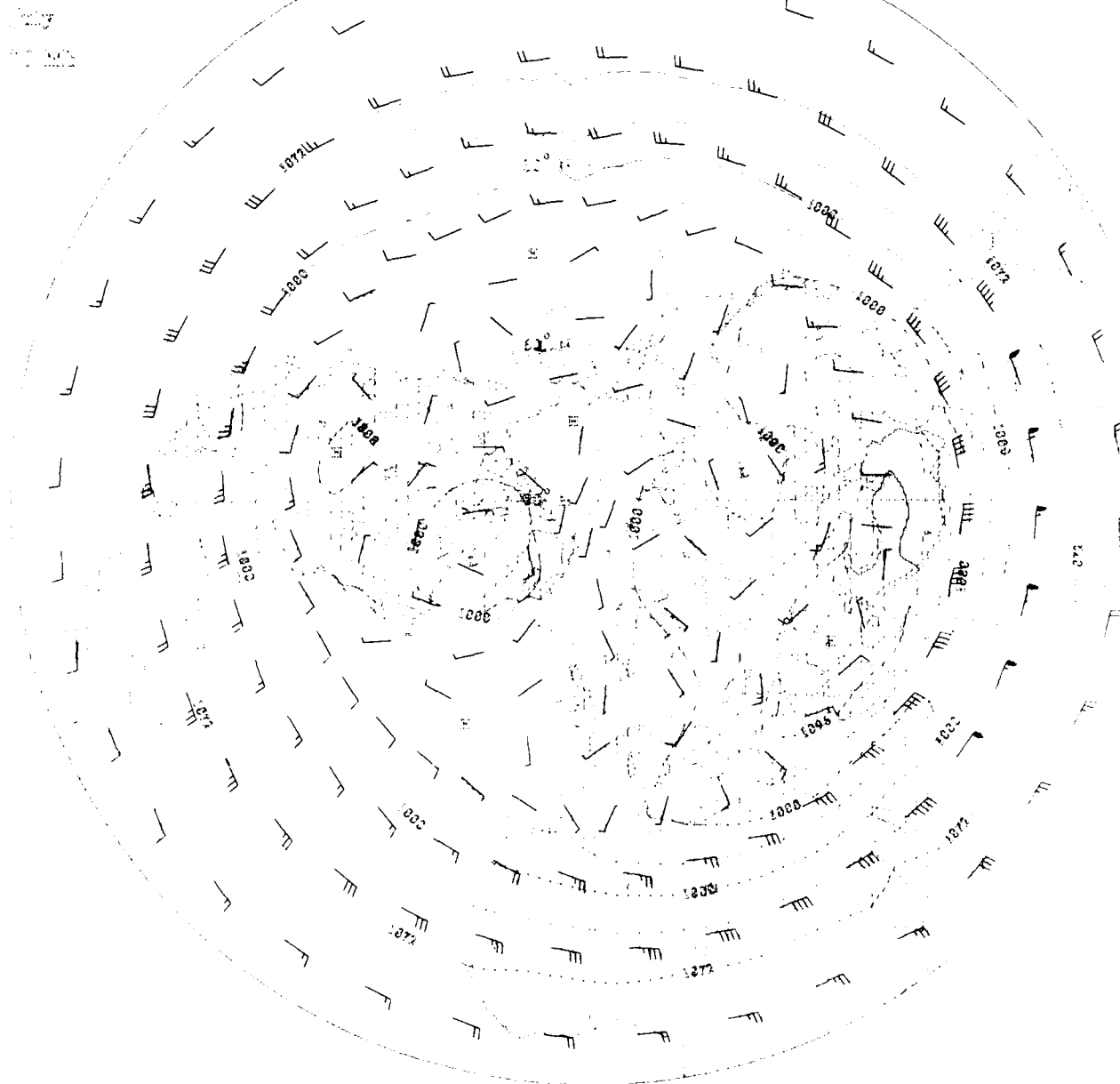


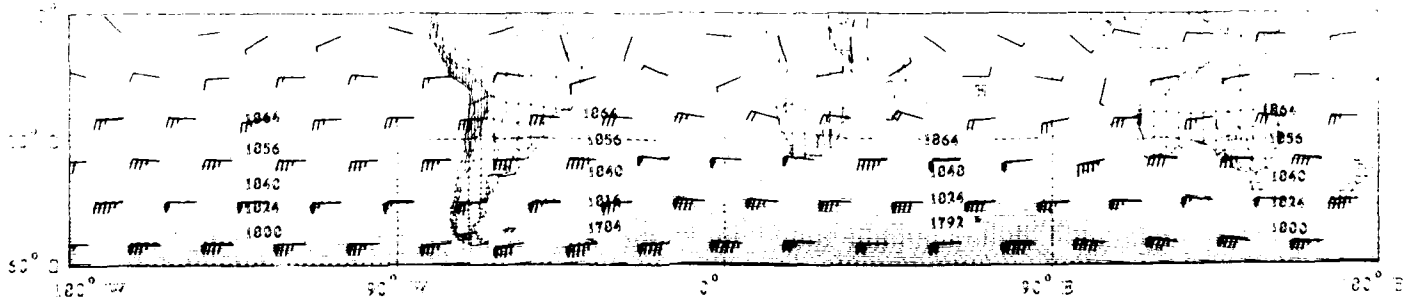
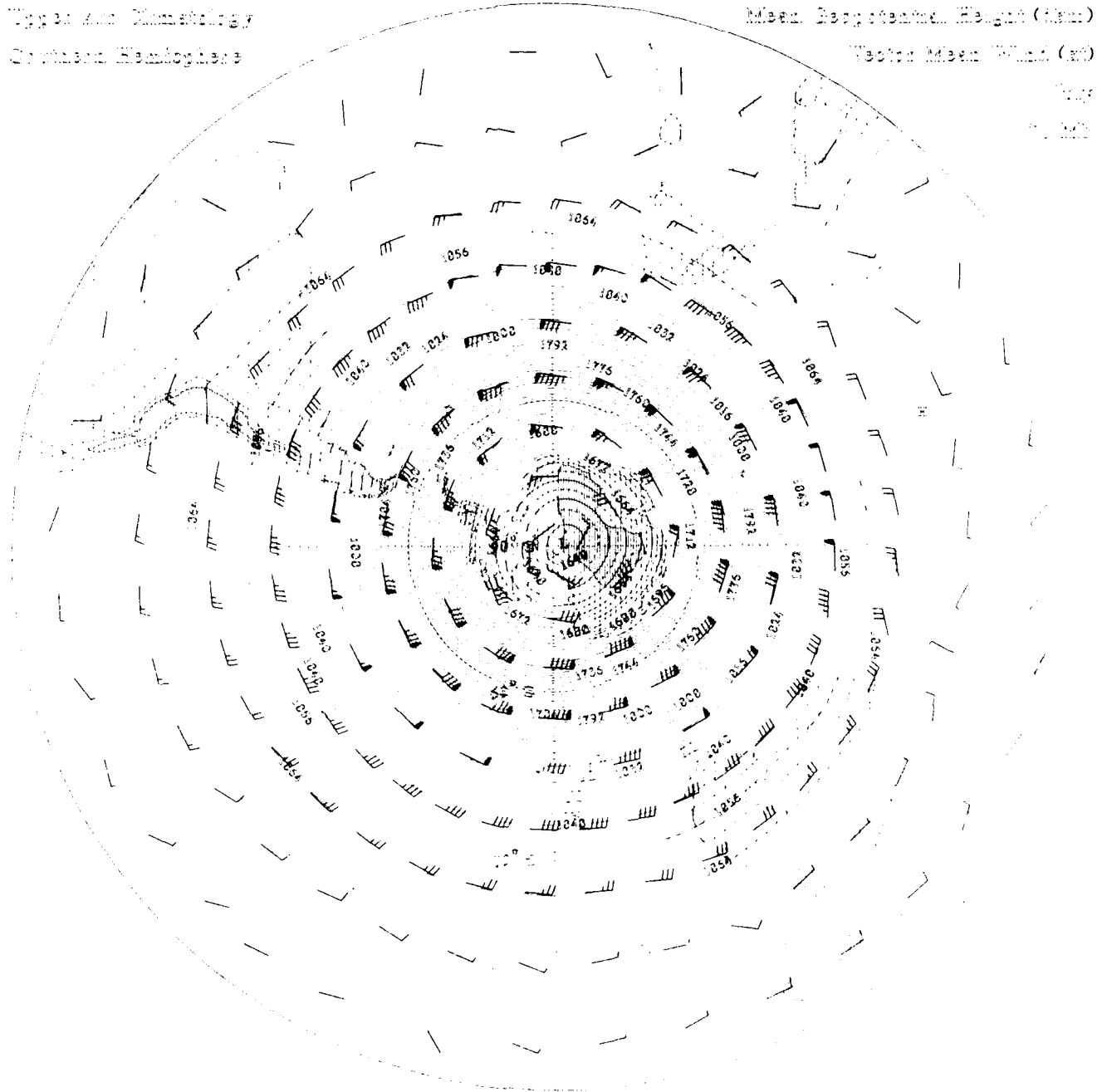
Figure 1 is a schematic representation of the experimental design. It shows a sequence of four stages: 'Stimulus presentation', 'Response', 'Feedback', and 'Next trial'. Arrows indicate the flow from one stage to the next. The 'Stimulus presentation' stage is represented by a box containing a question mark. The 'Response' stage is represented by a box containing a hand icon. The 'Feedback' stage is represented by a box containing a checkmark. The 'Next trial' stage is represented by a box containing a question mark.

Particular Members



Top: Air Temperature
Bottom: Humidity

Mean Sea Level Height (m)
Mean Sea Level (m)



Mean Geopotential Height (dgm)

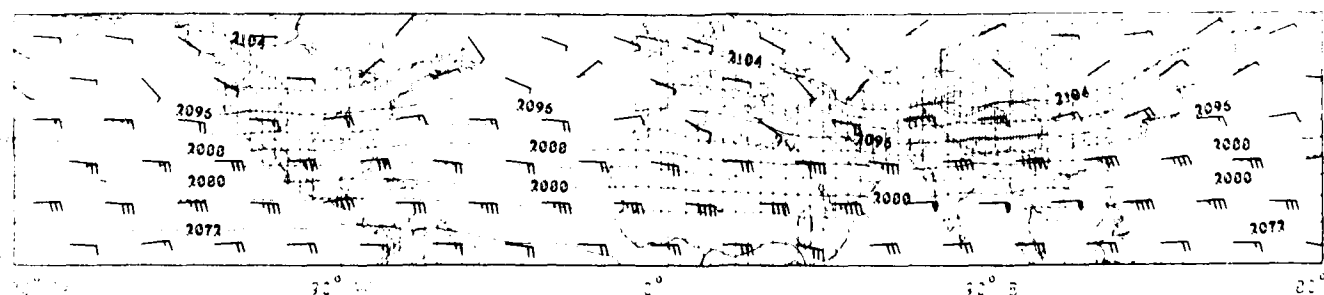
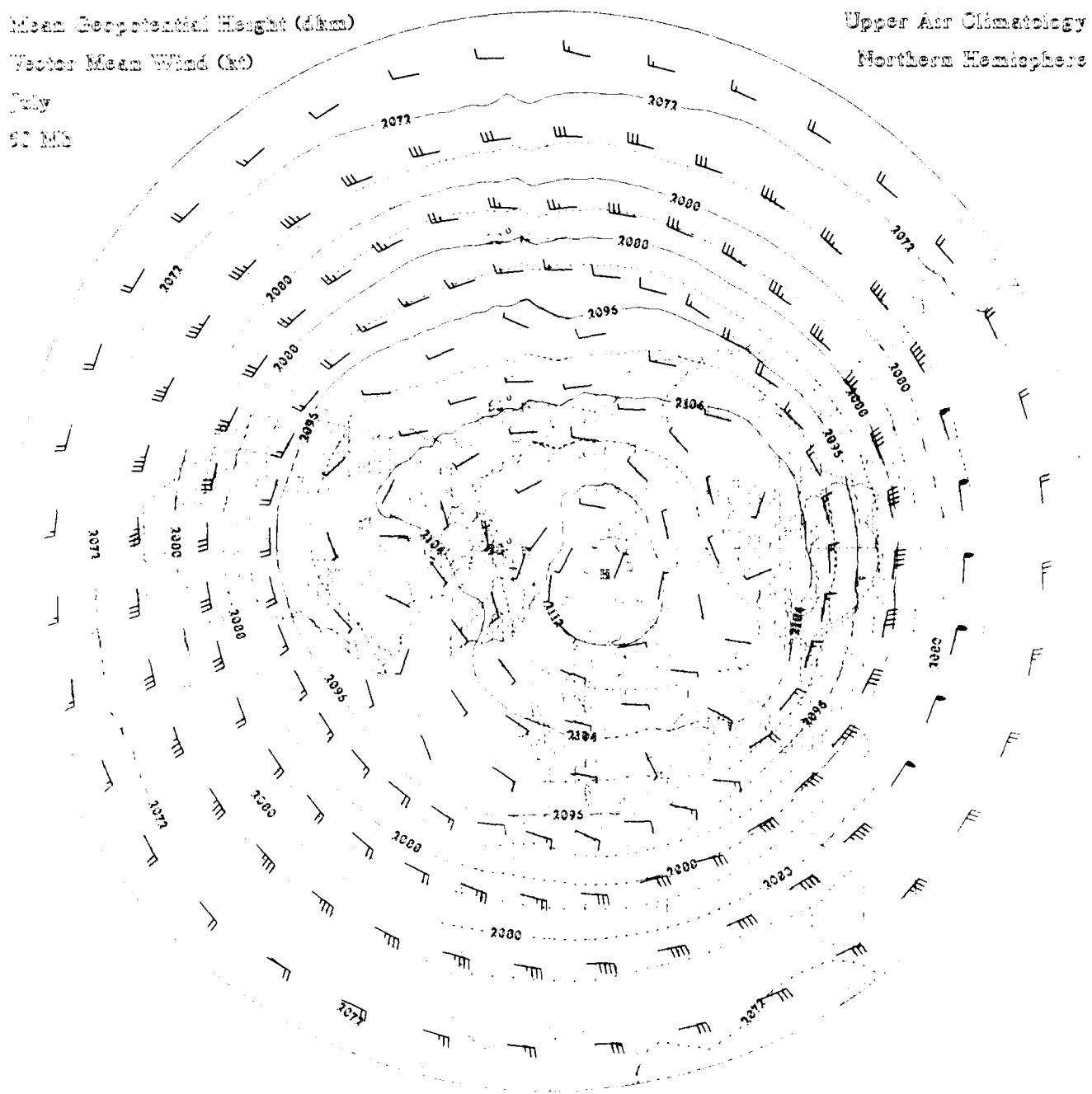
Vector Mean Wind (kt)

July

90 MB

Upper Air Climatology

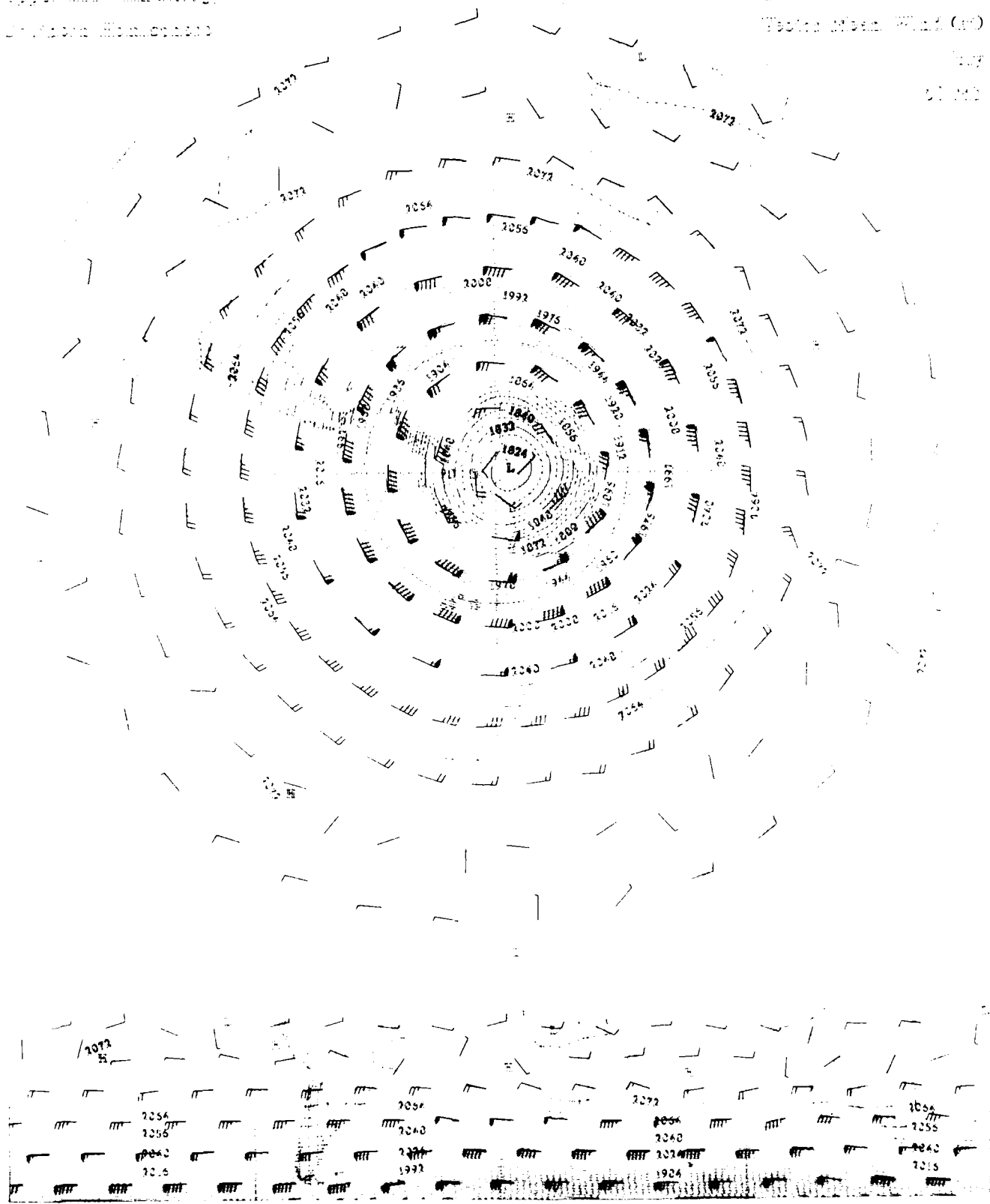
Northern Hemisphere



Topographic Chart
 of Area Around

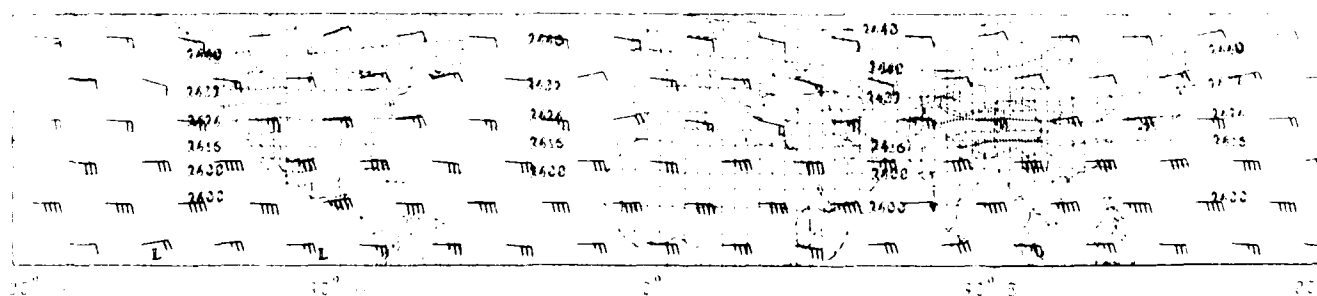
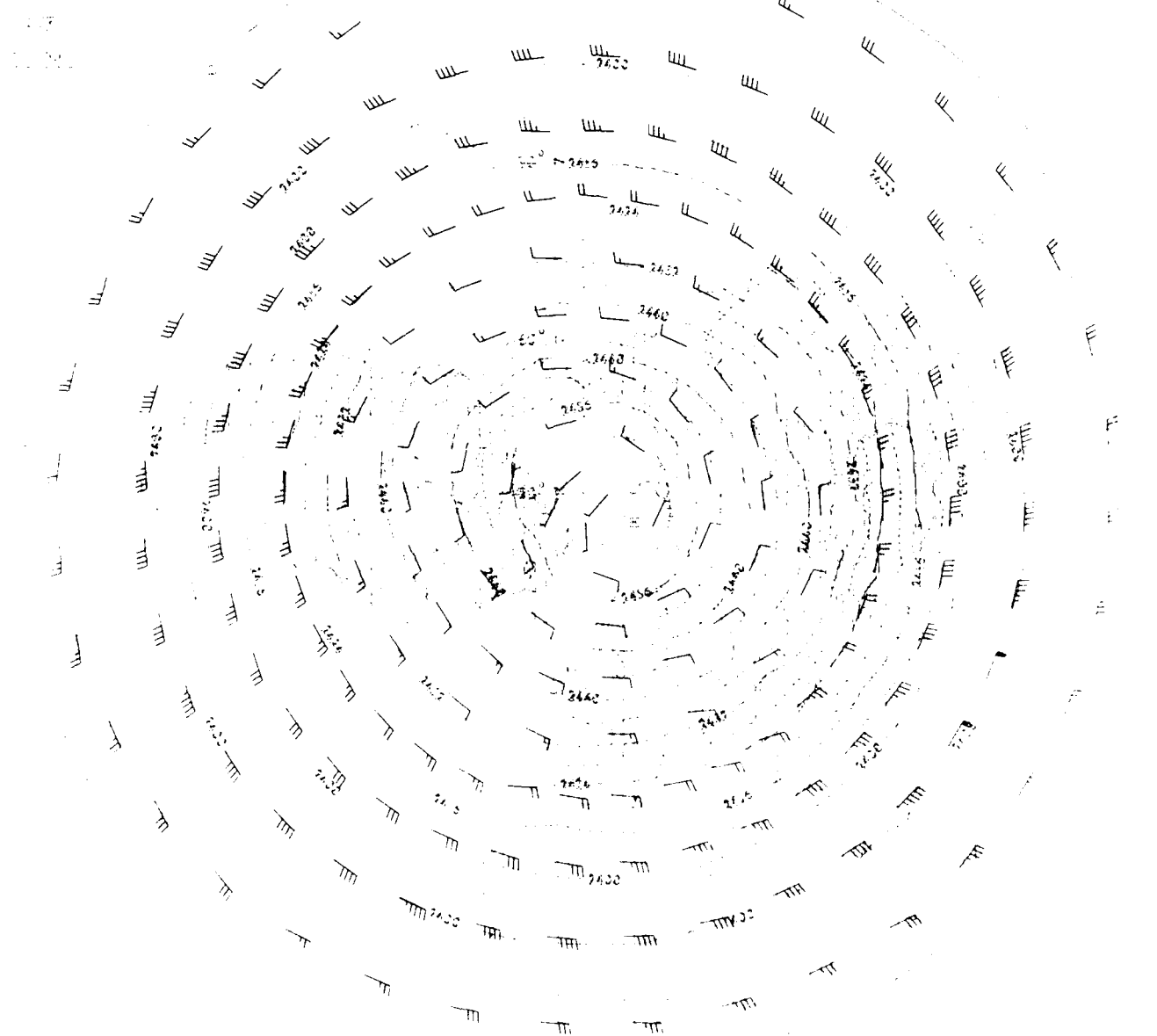
Mean Sea Level Height (ft)
 Tidal Mean Wind (ft)

July
 1972



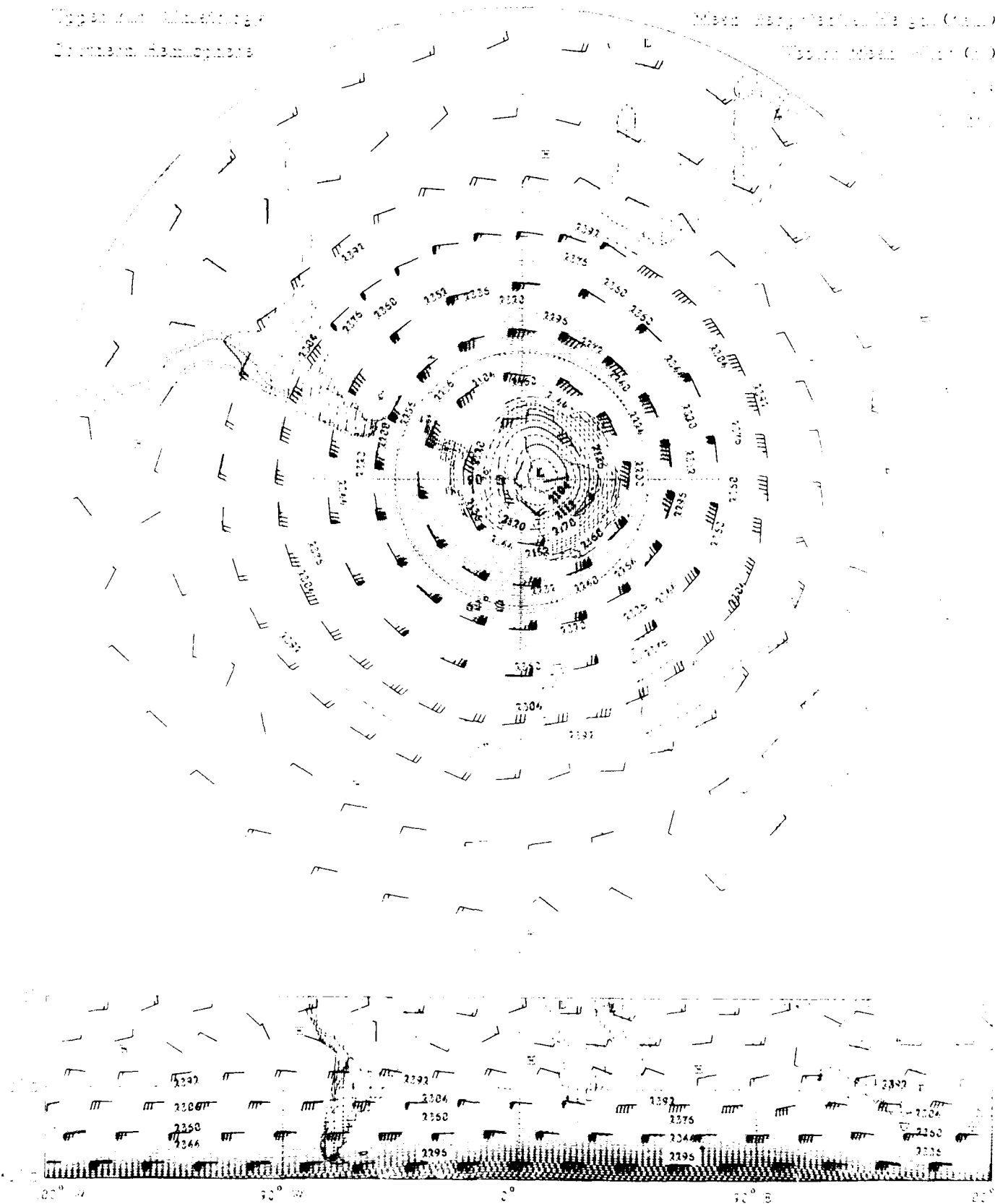
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Received 26 August 2012



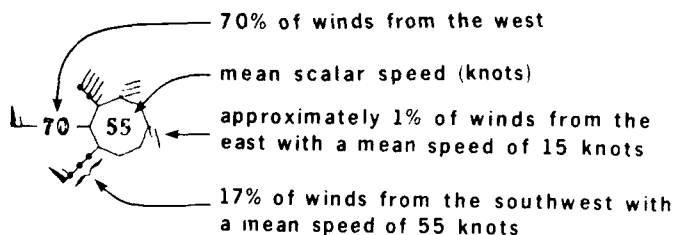
Topographic Map
 of the Hawaiian Islands

Mean Sea Level (m.s.l.)
 1980 Mean (m.s.l.)

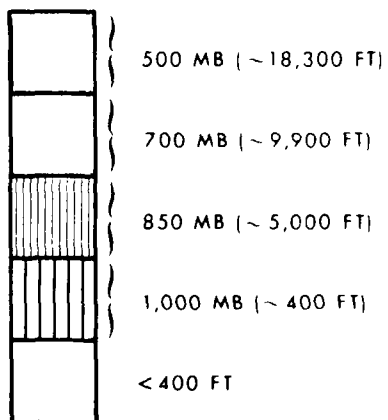


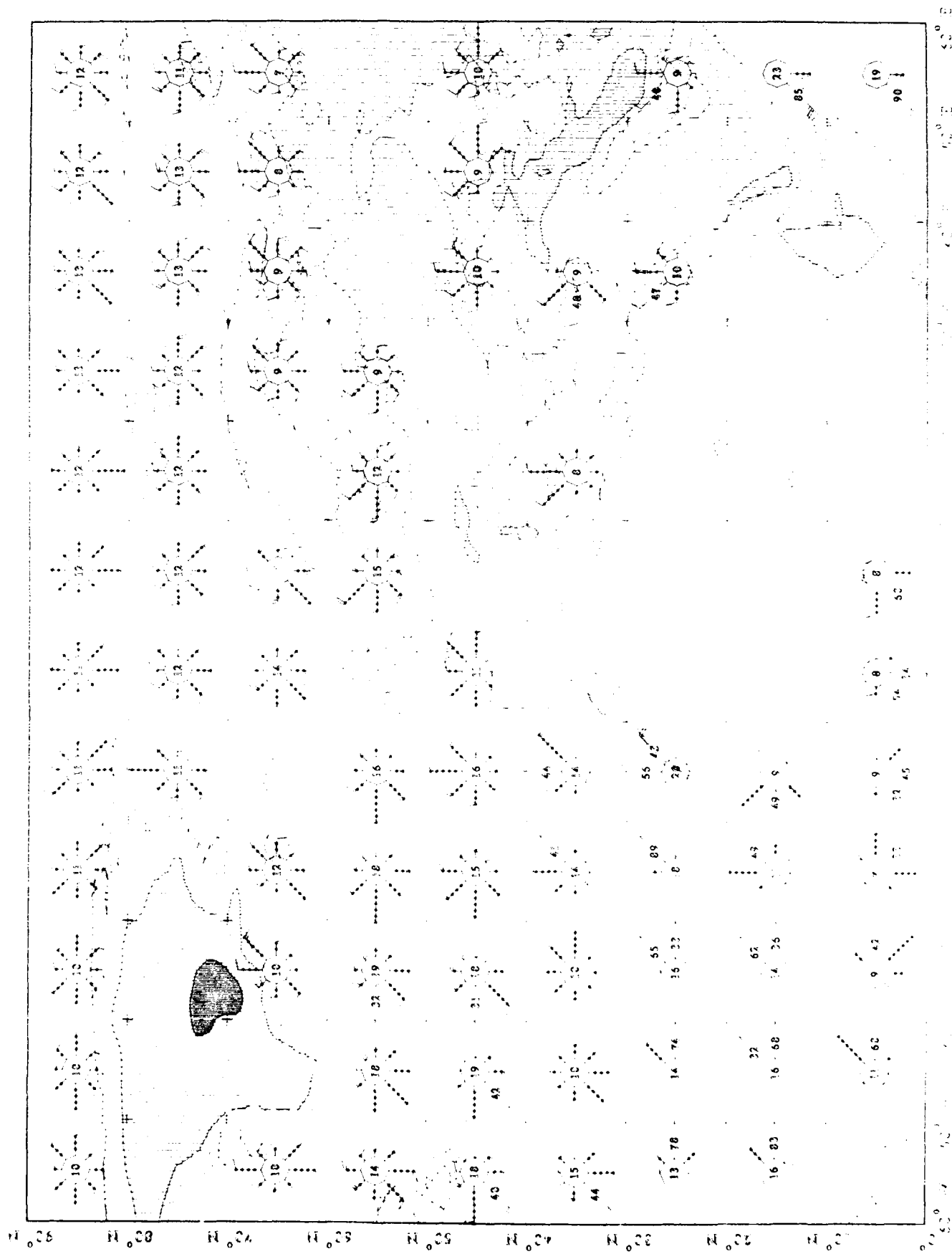
WIND ROSES (13 LEVELS, 1000 TO 30 MB)

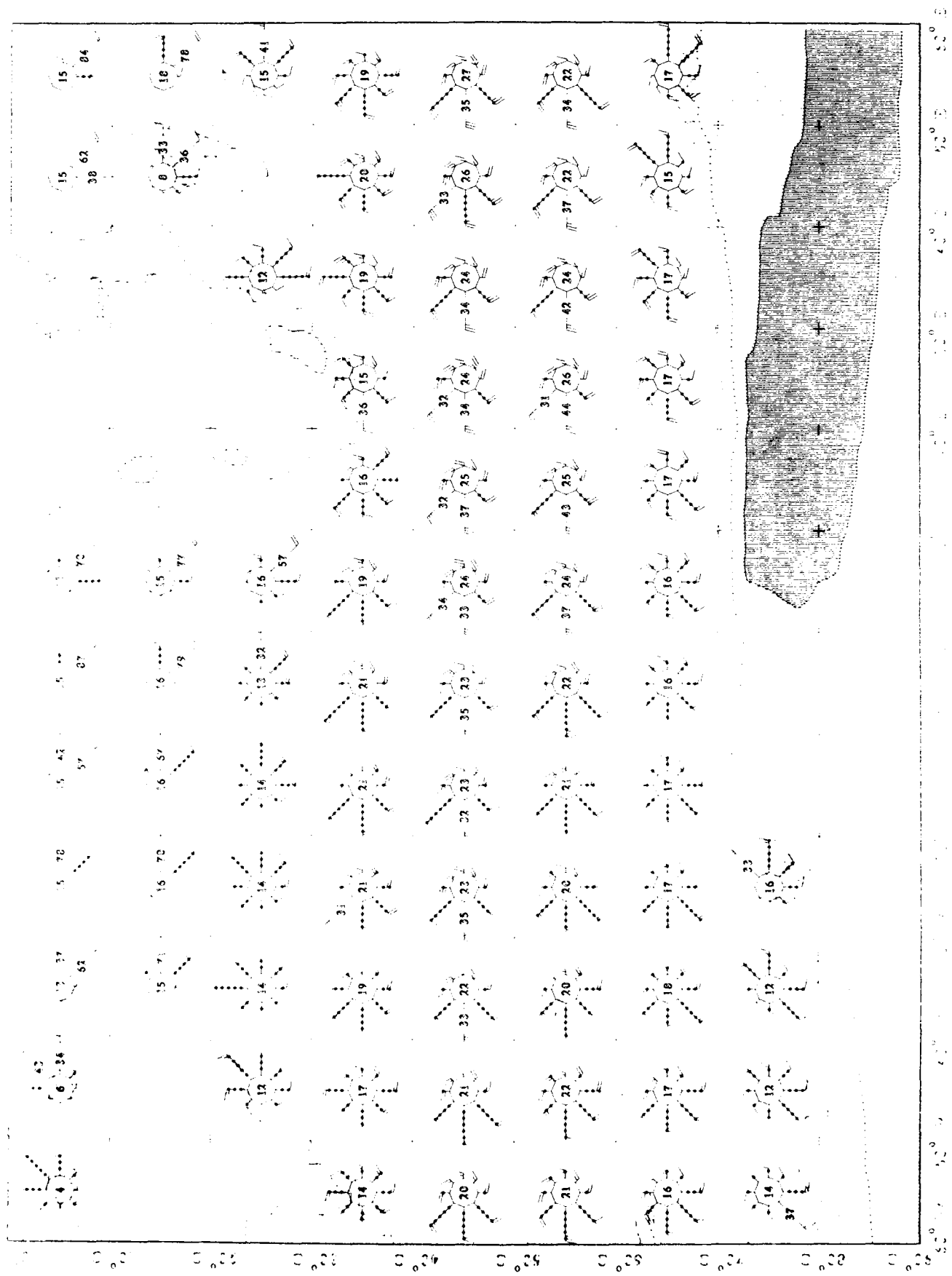
- Wind roses at 10 degree latitude/longitude grid points
- Directional mean wind speed in 5 knot increments
- Frequency proportional to barb length with individual dots representing 5% increments. Values greater than 30% are plotted directly on the barb.
- Roses blanked at grid points with elevations exceeding specified geopotential heights.
- Sample rose explanation:



ELEVATION SCALE



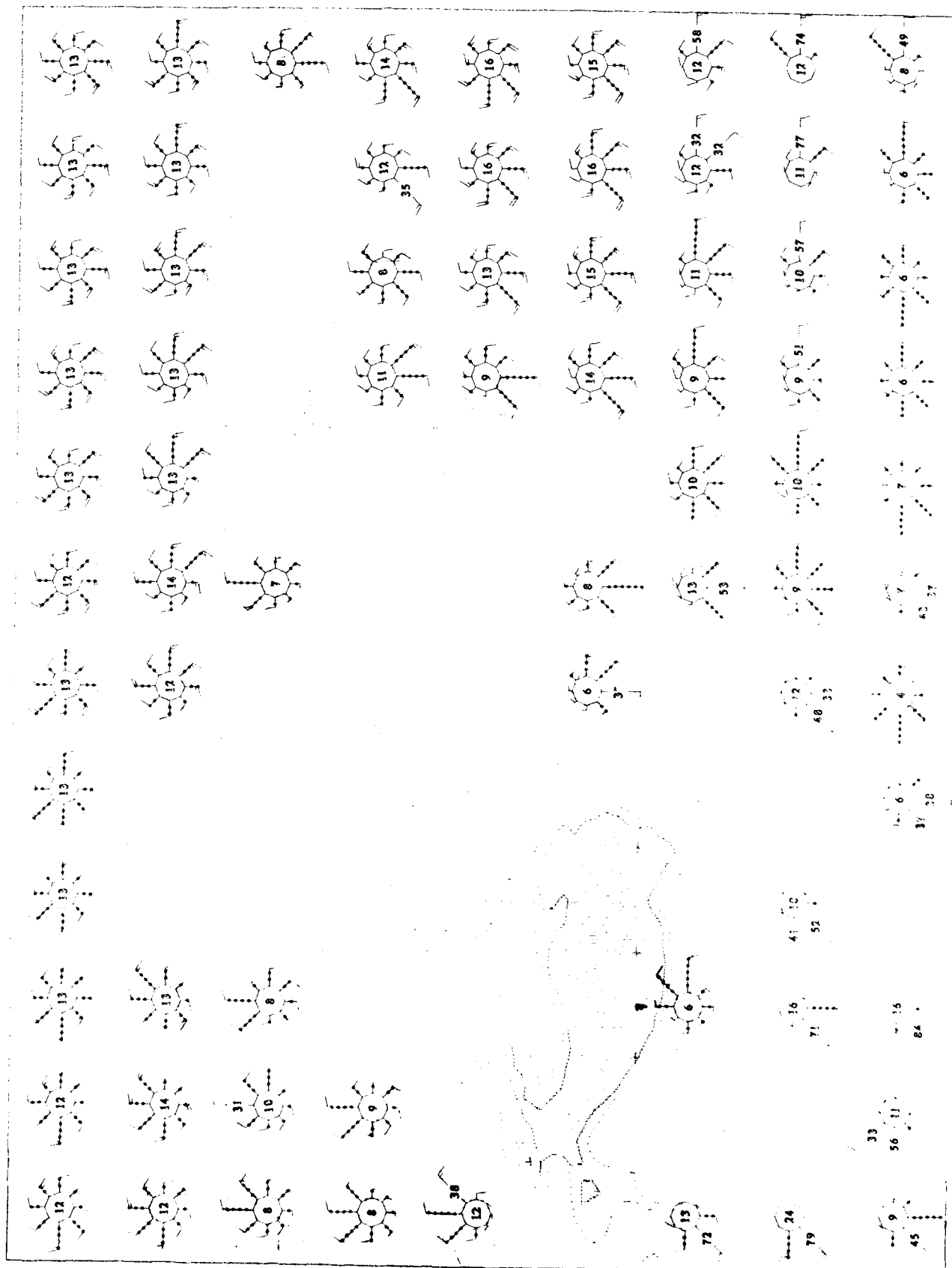


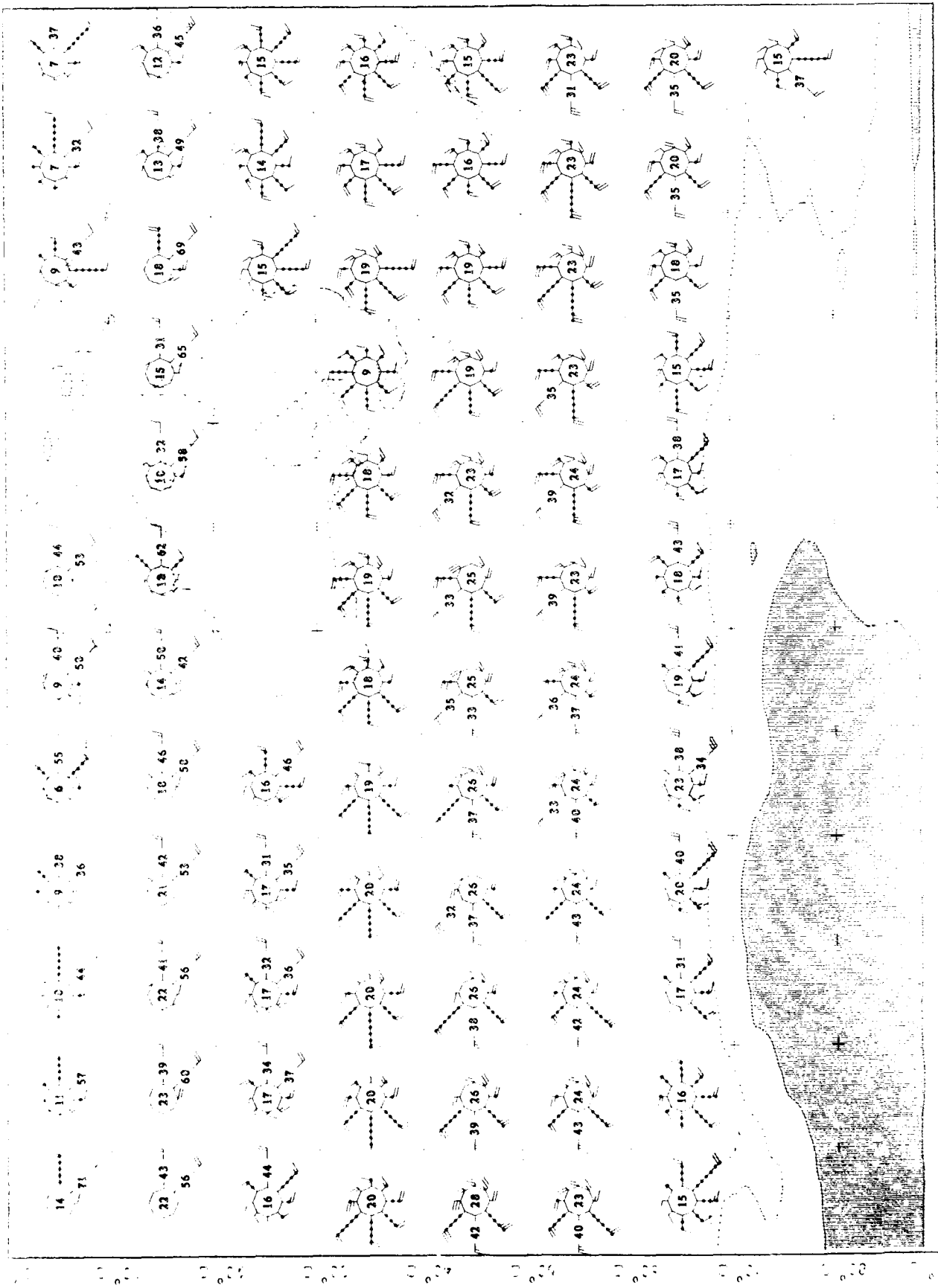


Types and Diminutives Northern Hemisphere

Types and Diminutives
Northern Hemisphere

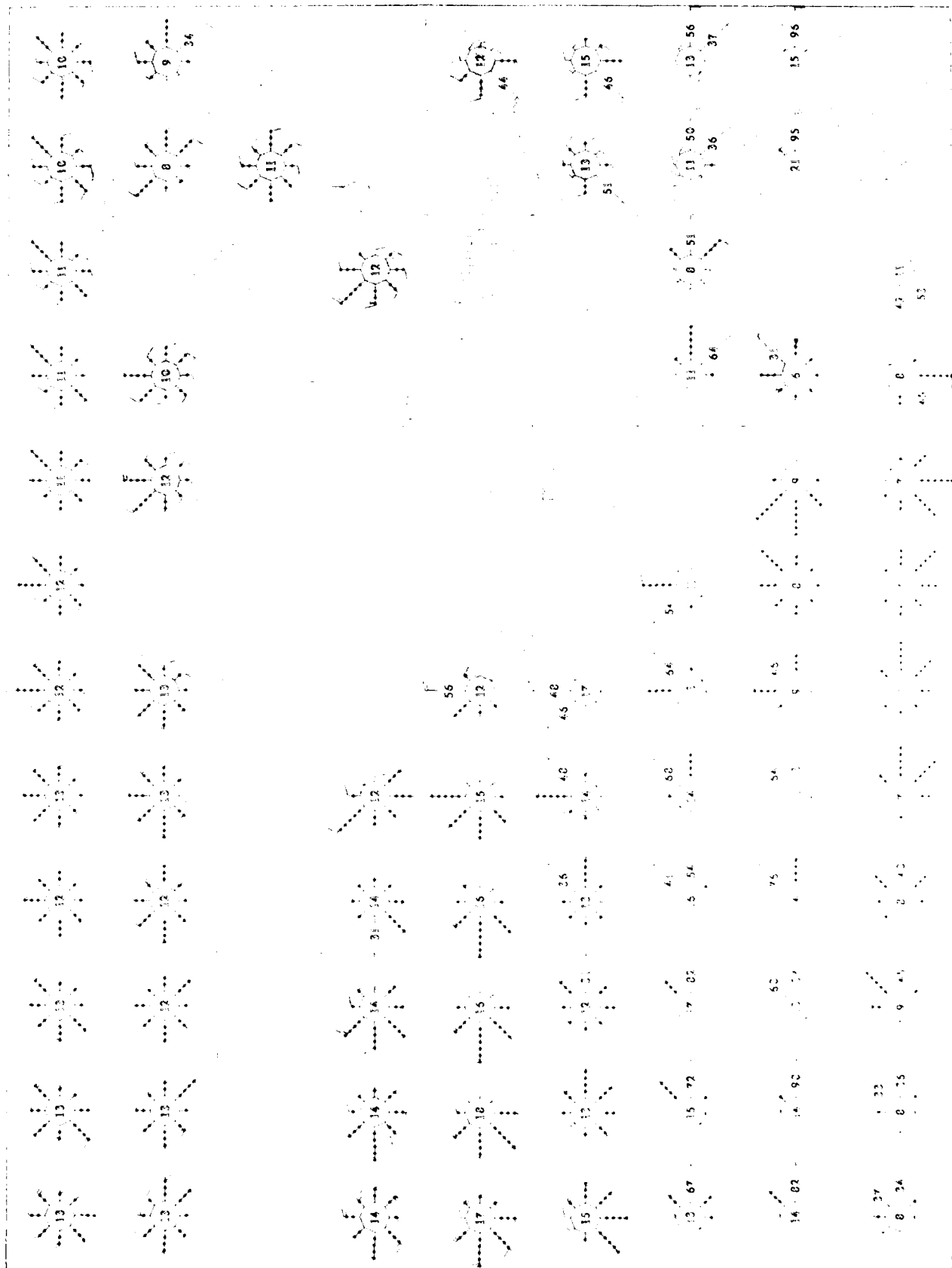
Types and Diminutives
Northern Hemisphere





Upper Air Climatology
Geophysical Hemisphere

Italy
1000 m



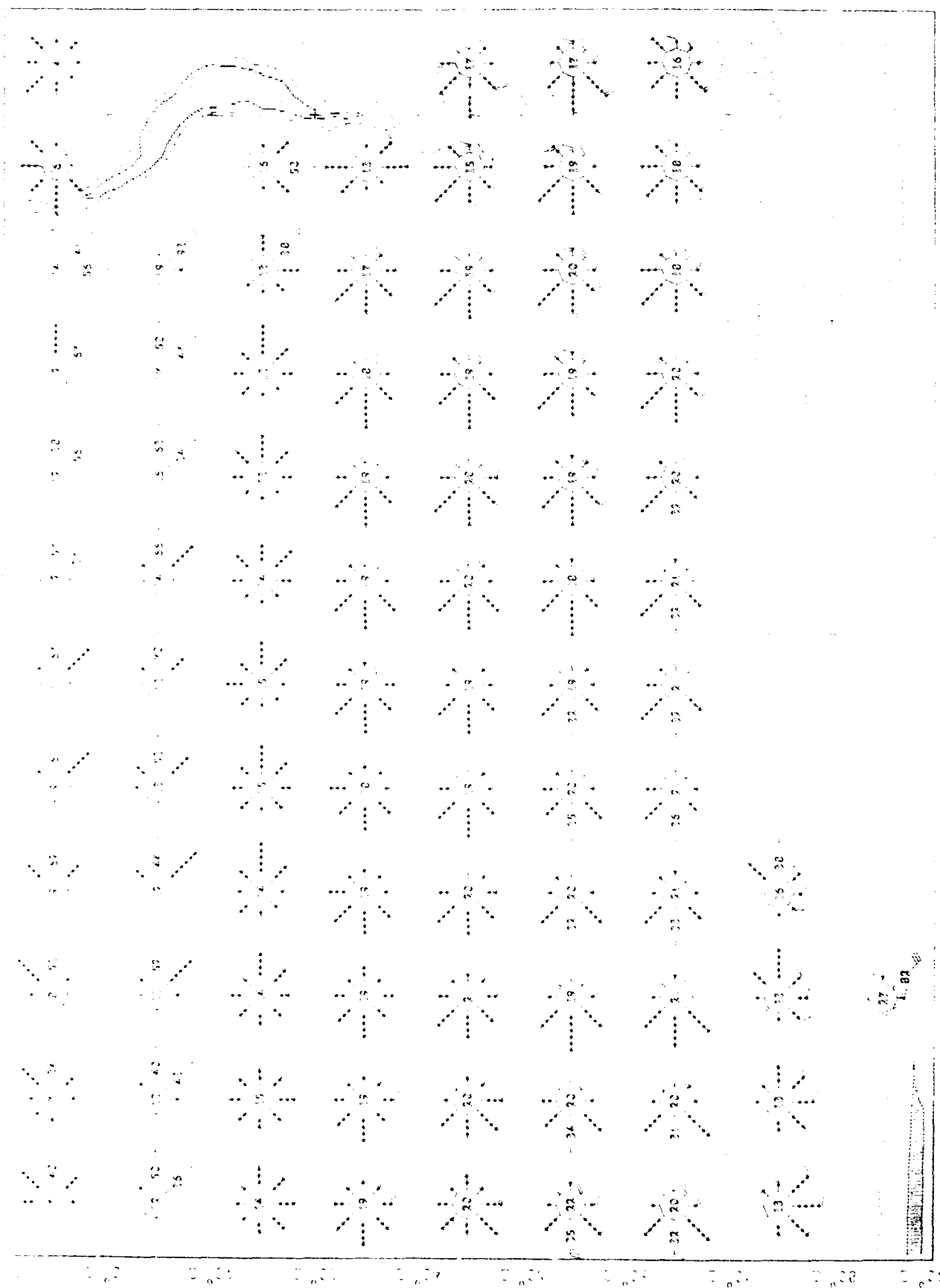
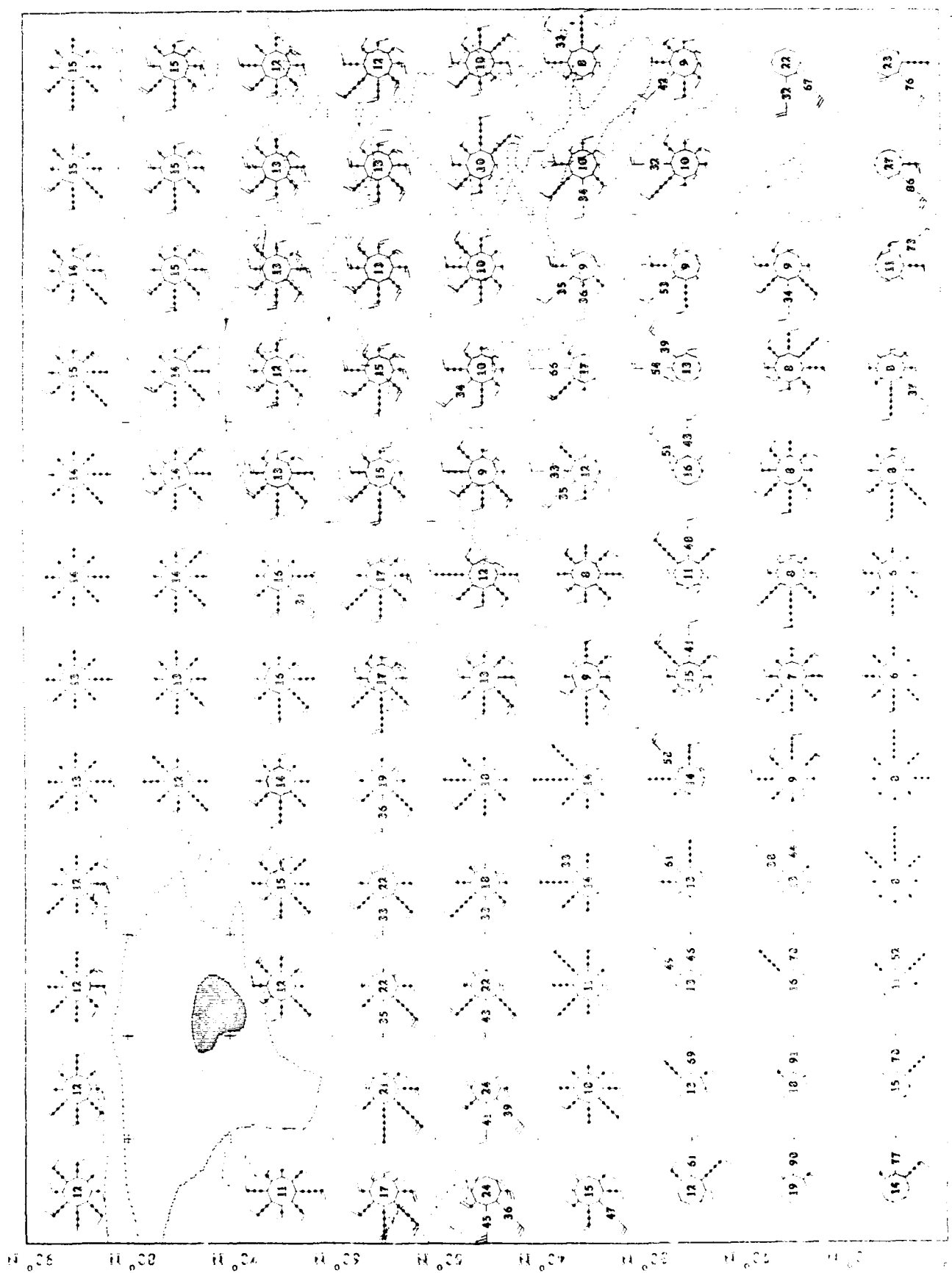
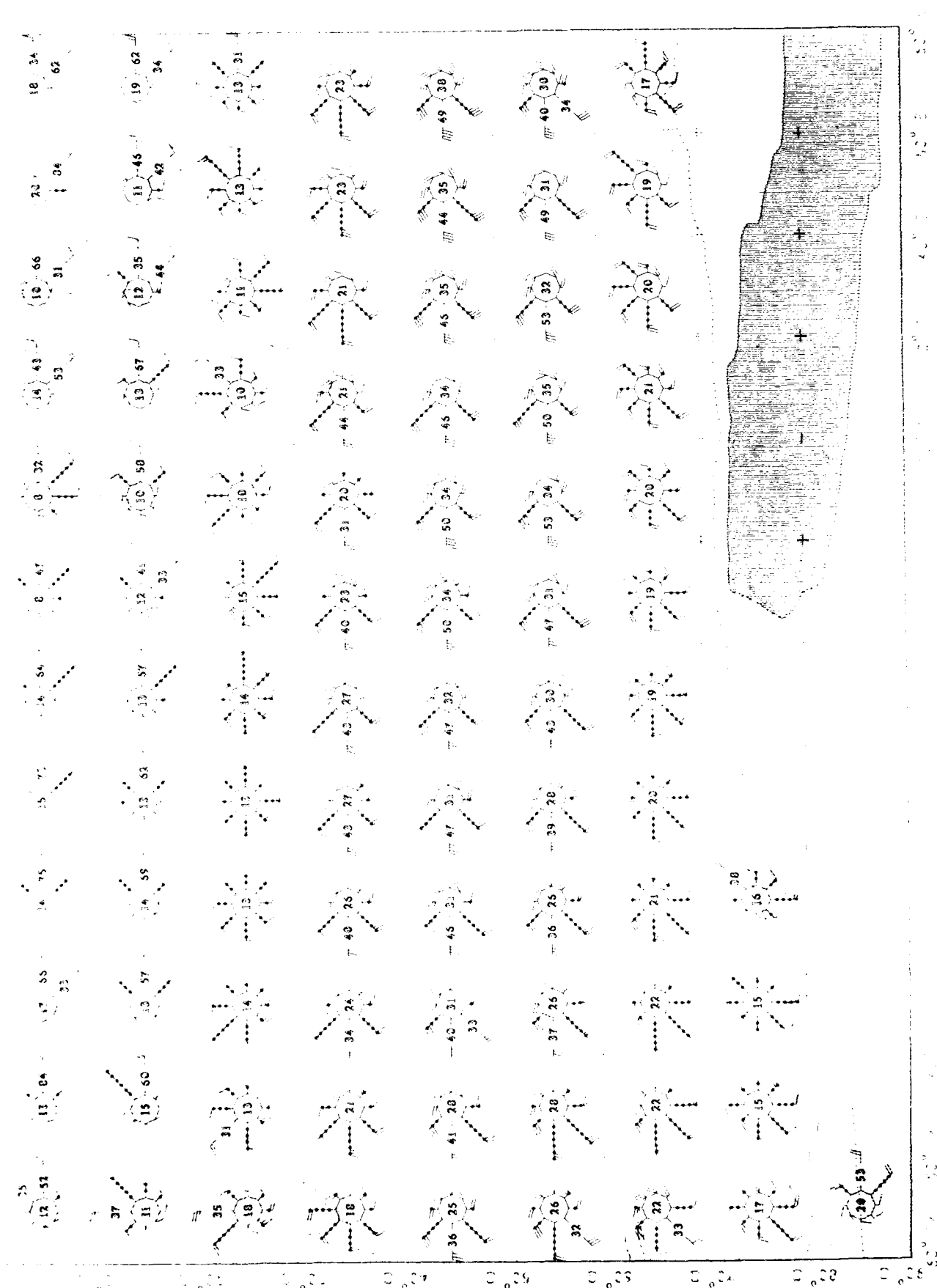


Fig. 20. Map of the ...
 ...

...

...

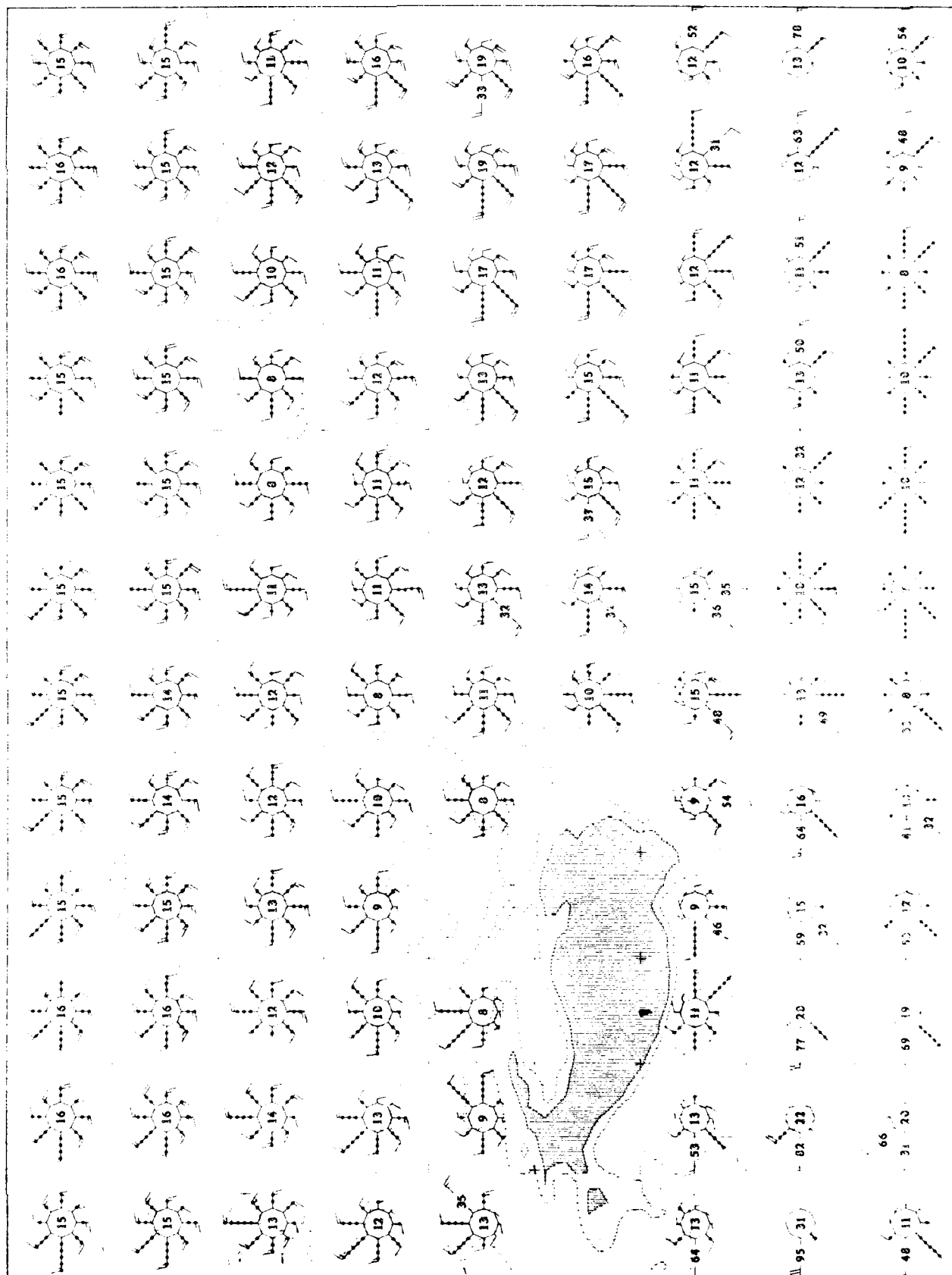


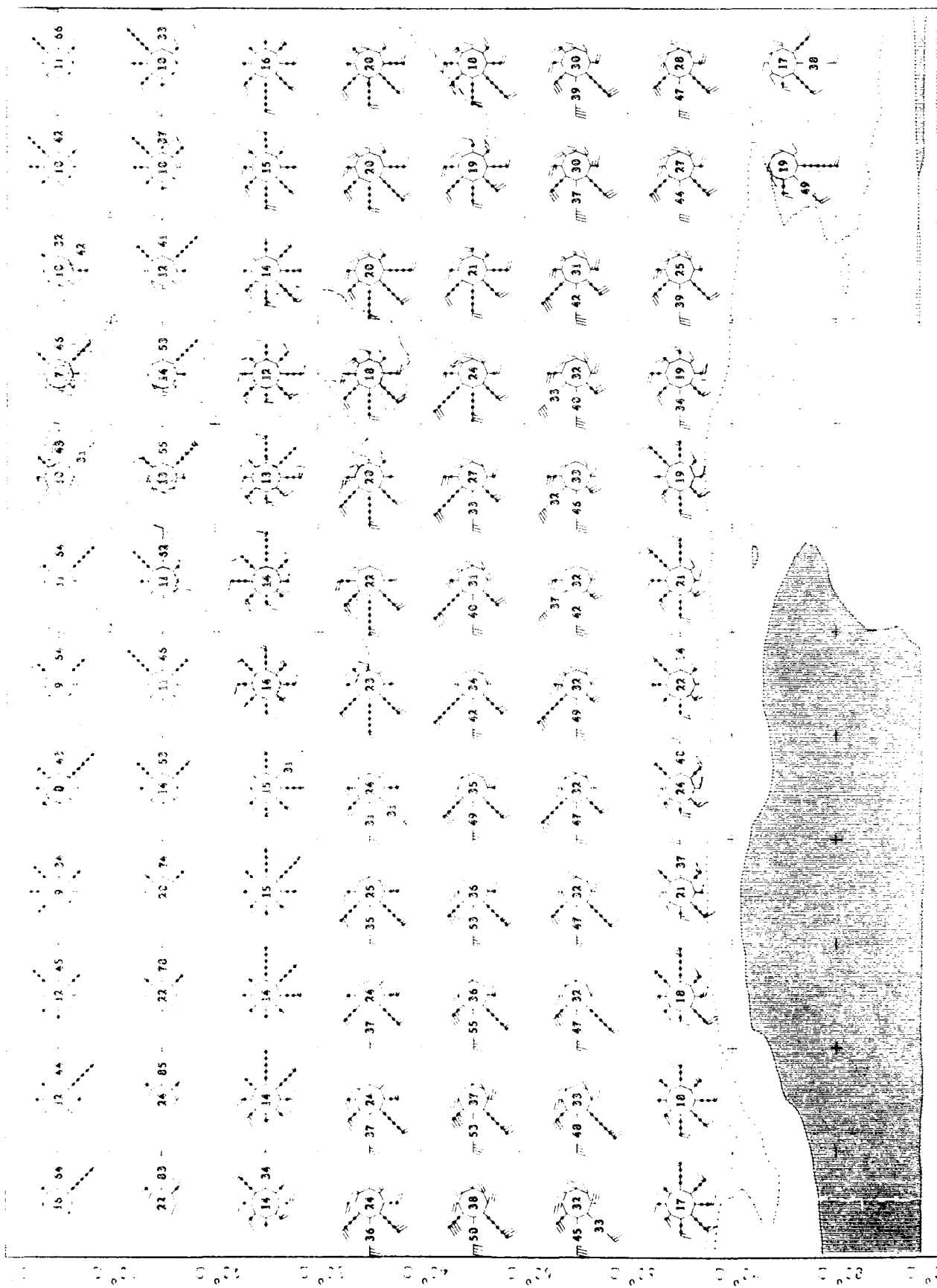


Upper Air Climatology
Southern Hemisphere

July 1954

July 1954

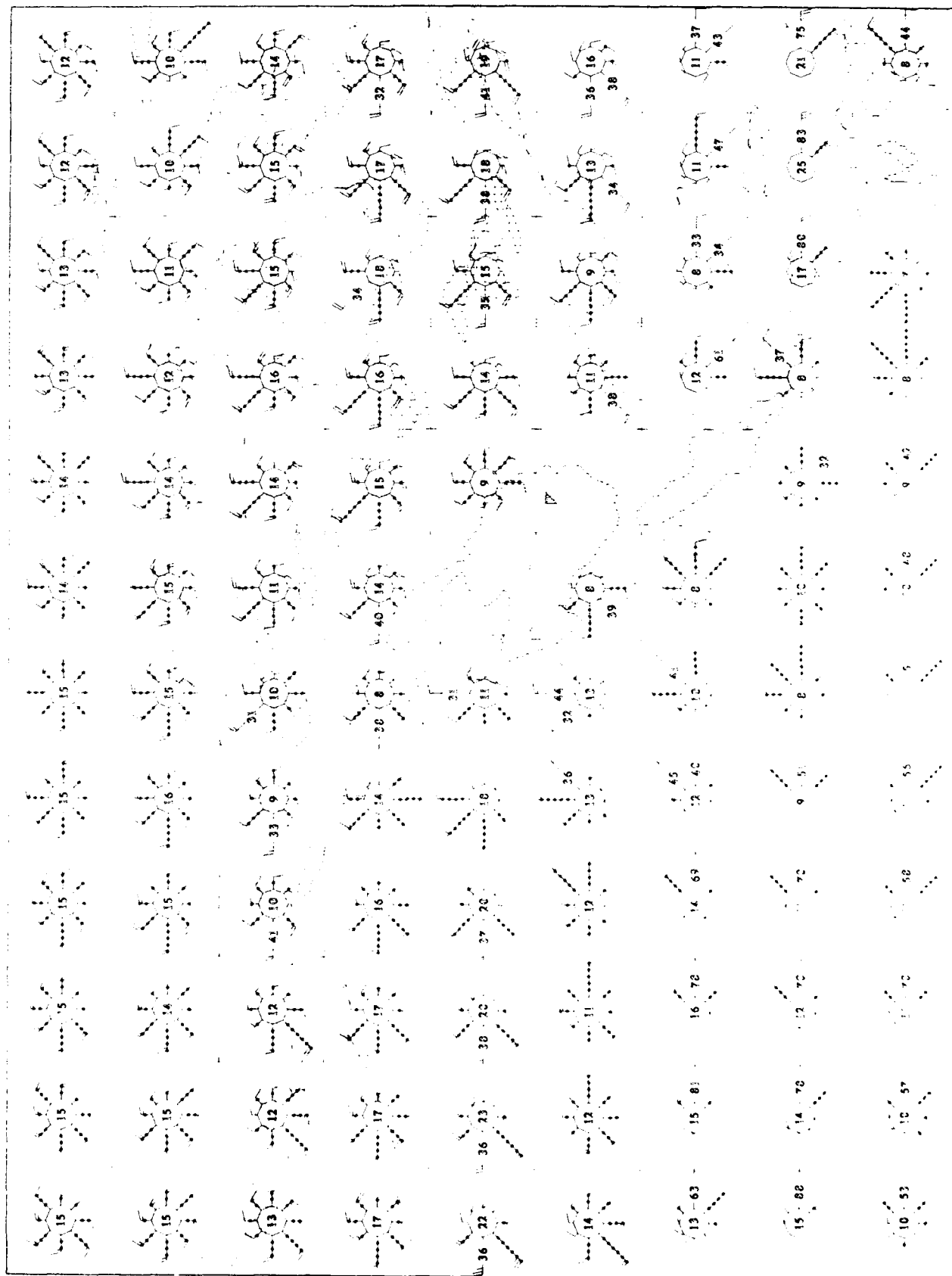


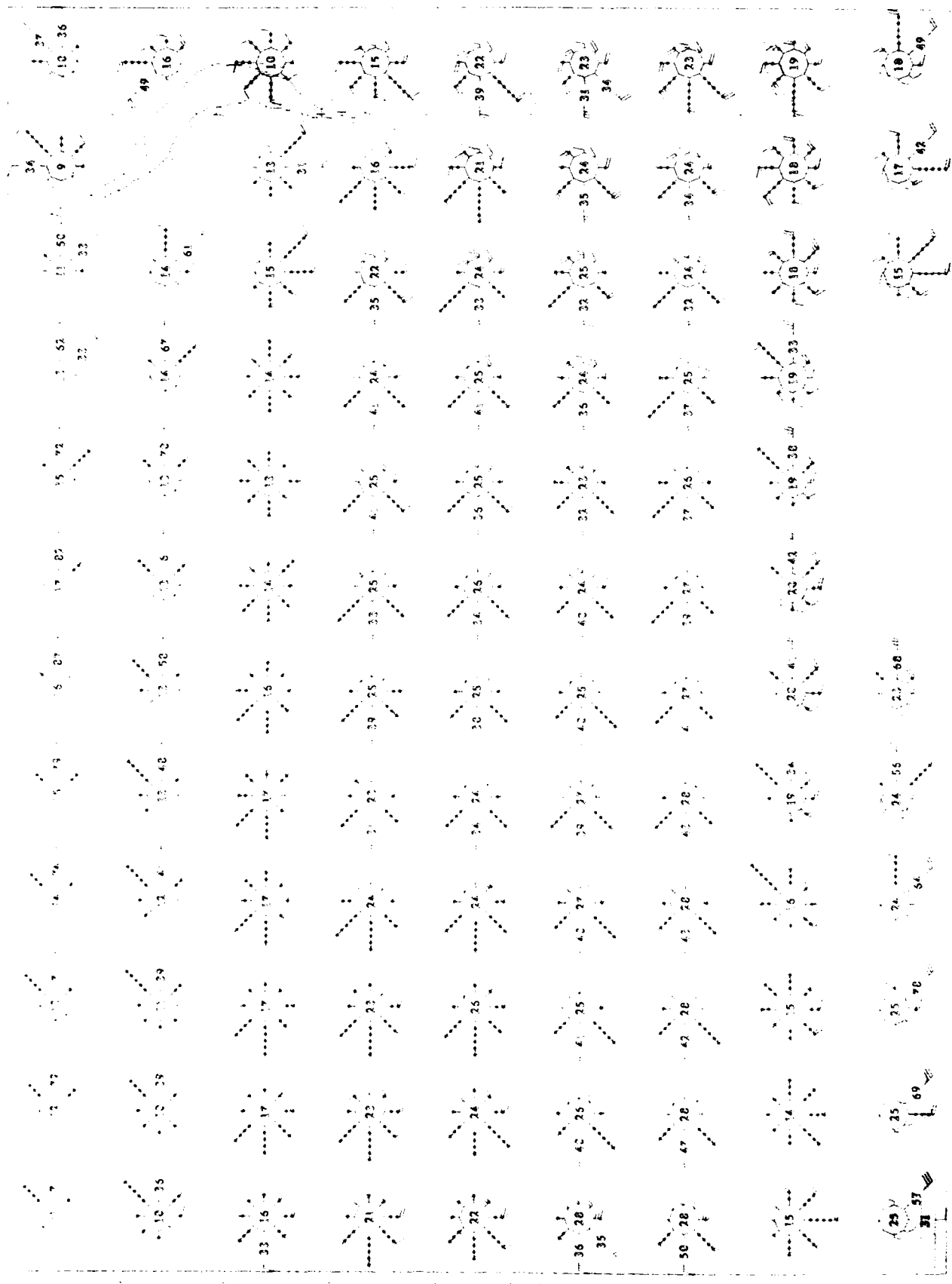


Wagner and Gammelsdorf
On the Development of the

1881

1881

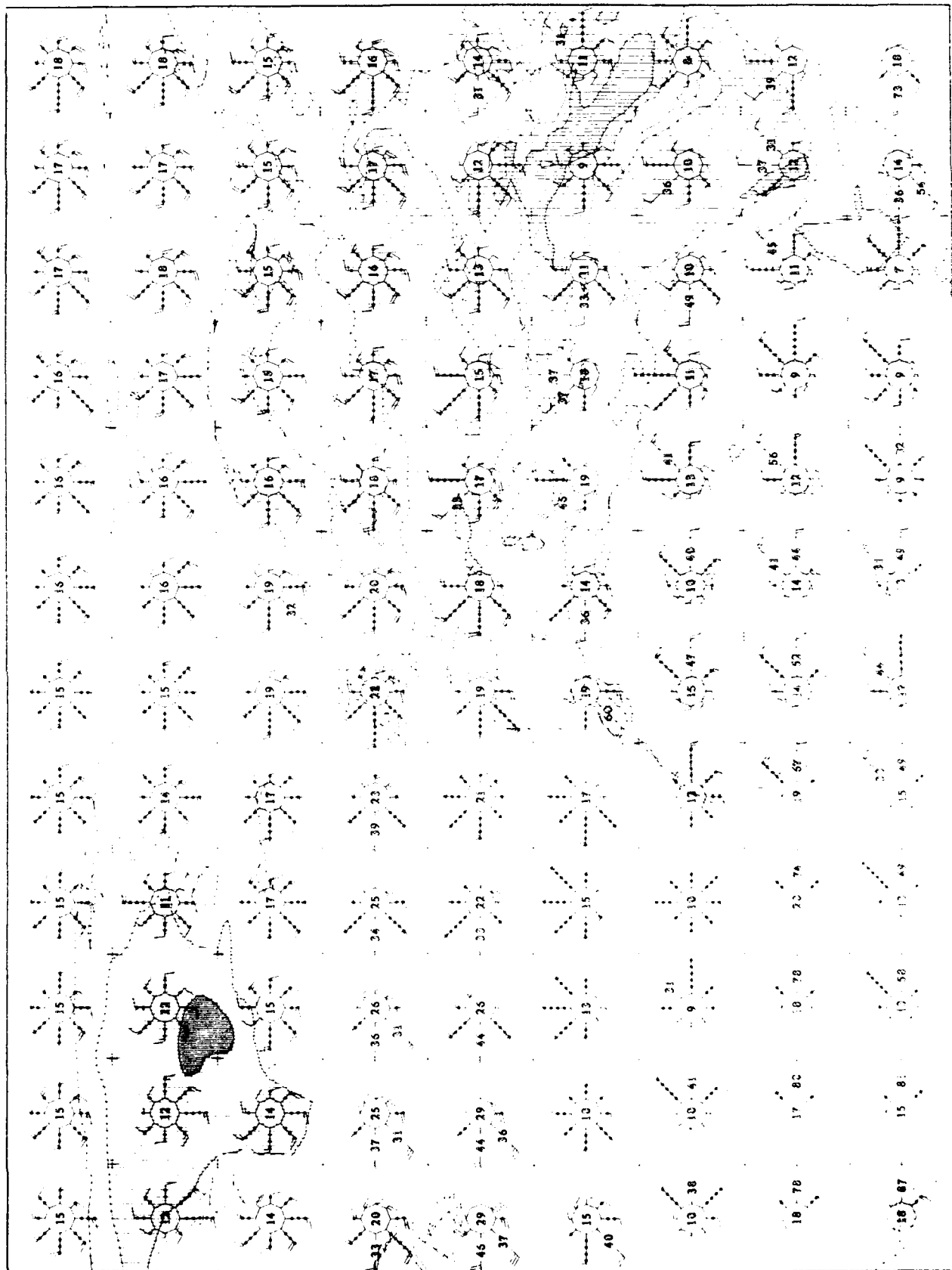


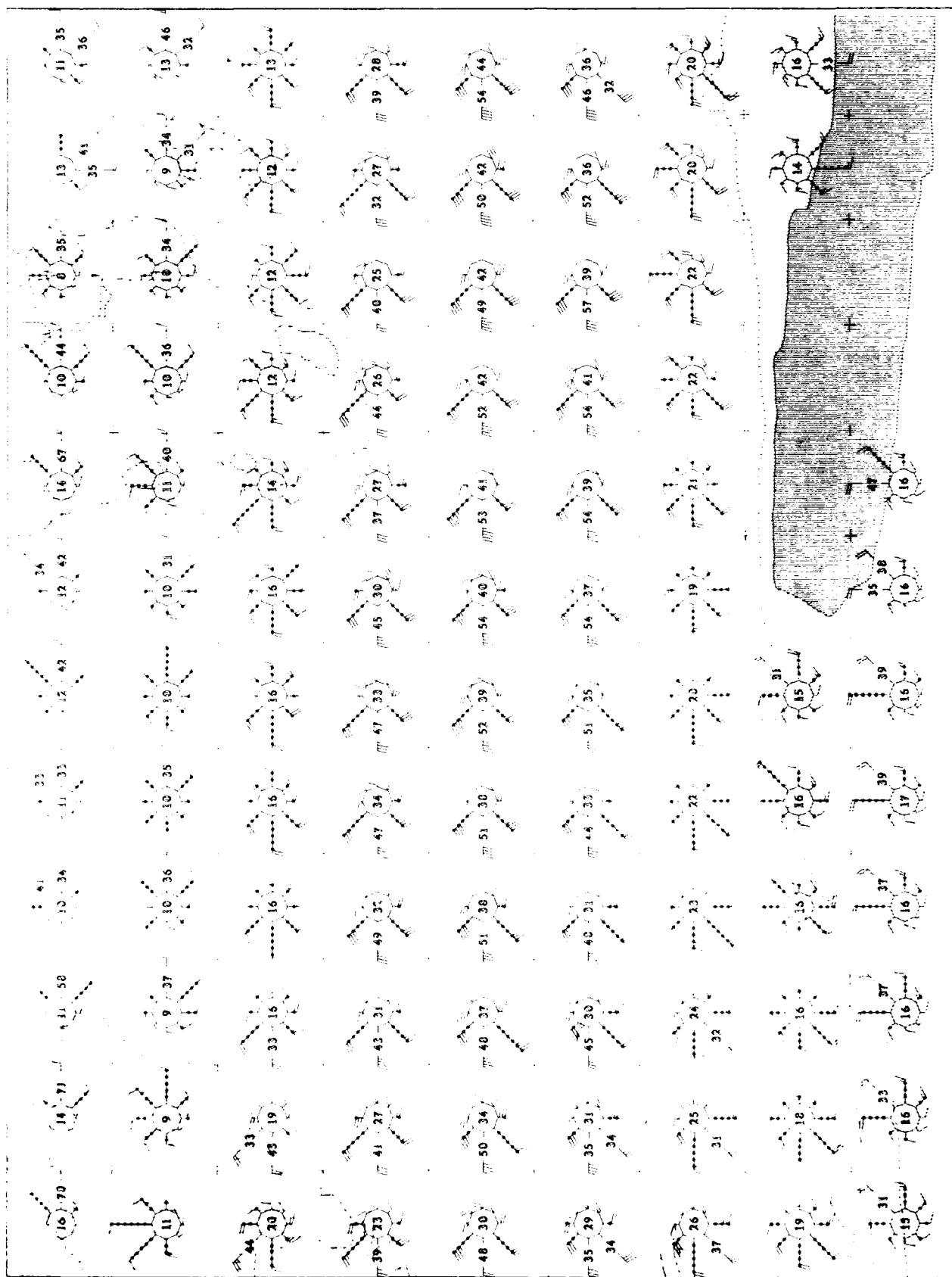


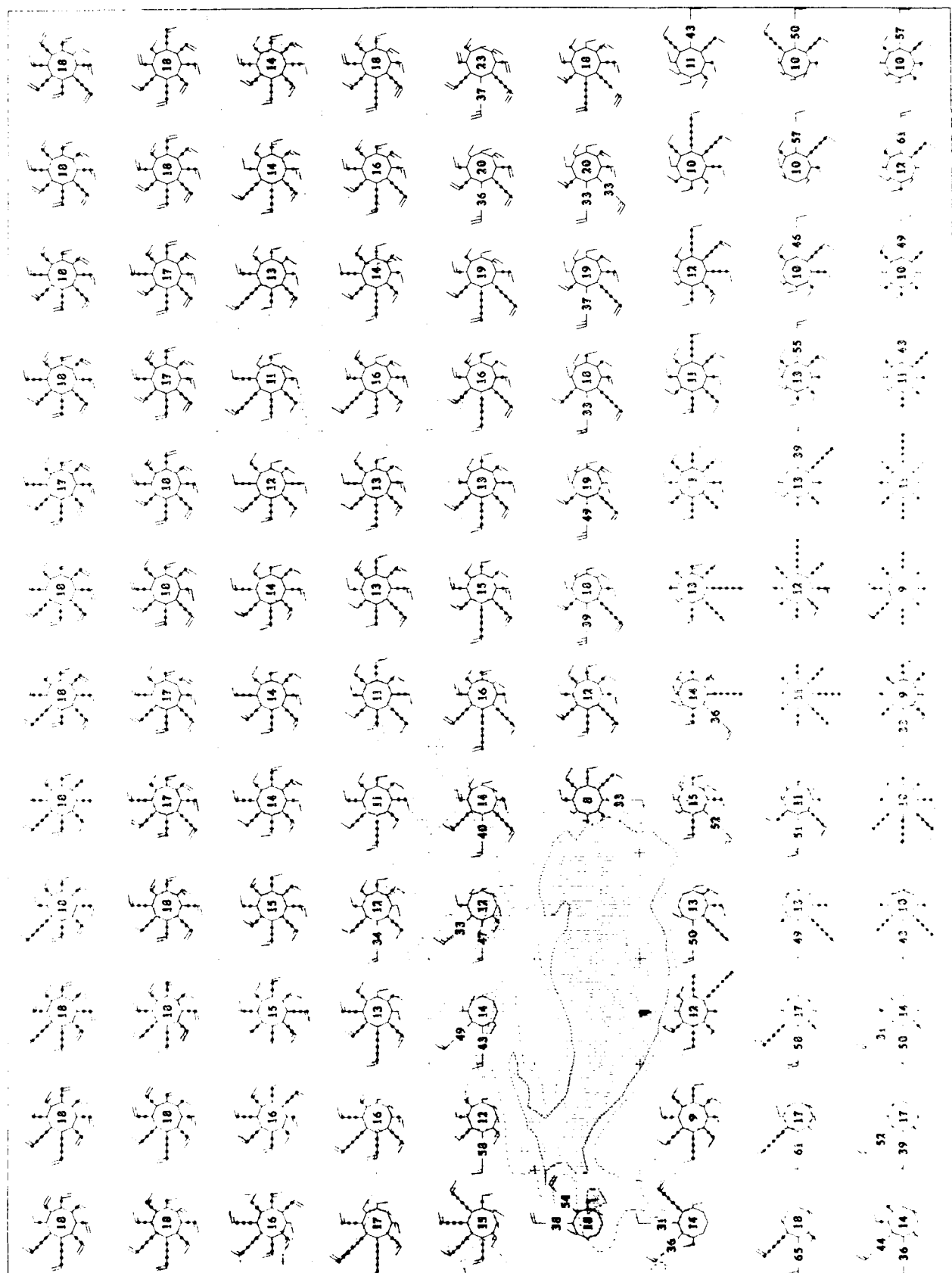
1. 100 stars for tracing
 2. 100 stars for tracing
 3. 100 stars for tracing

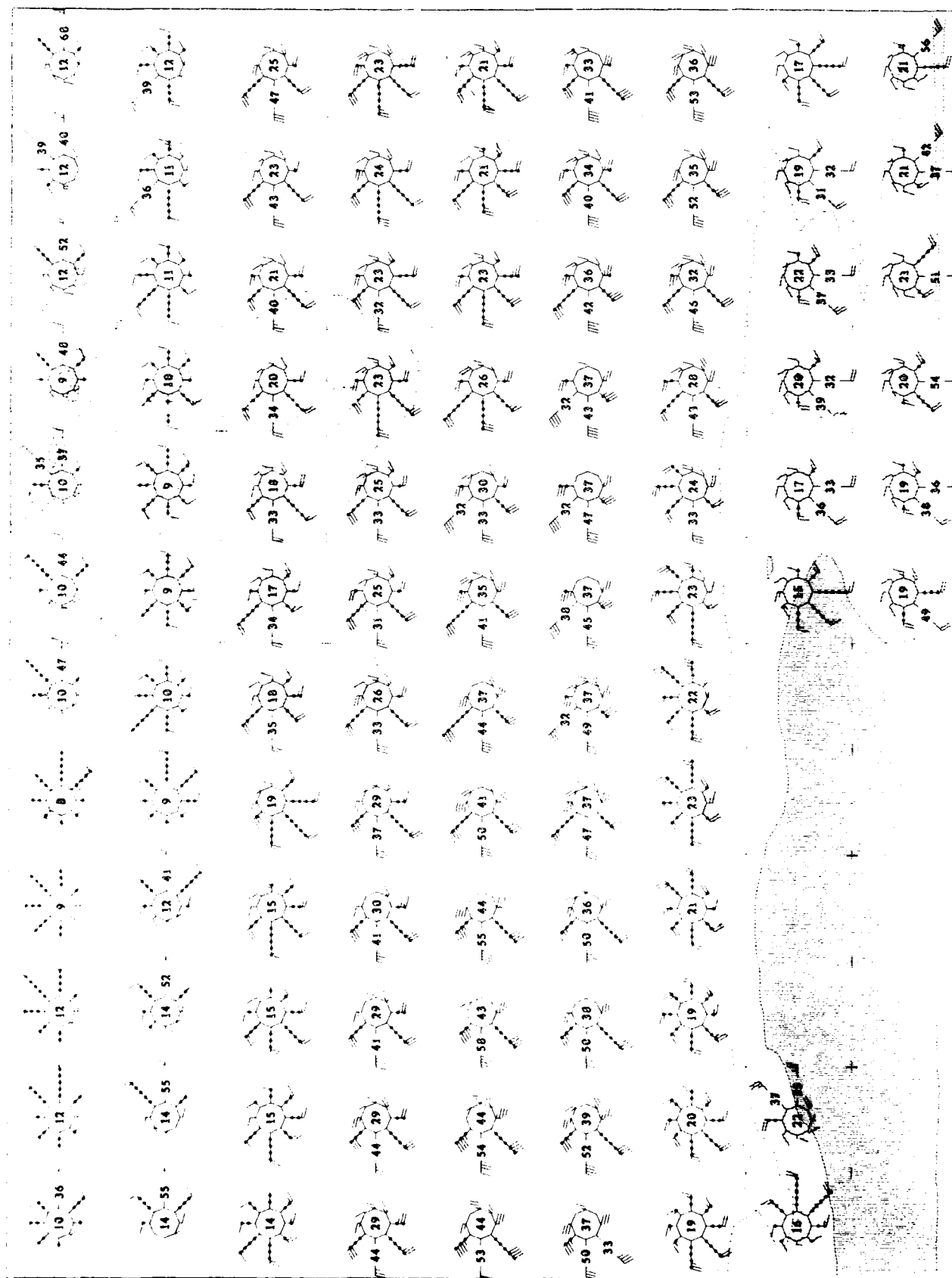
4. 100 stars for tracing
 5. 100 stars for tracing

92° N 80° N 70° N 60° N 50° N 40° N 30° N 20° N 10° N 0°





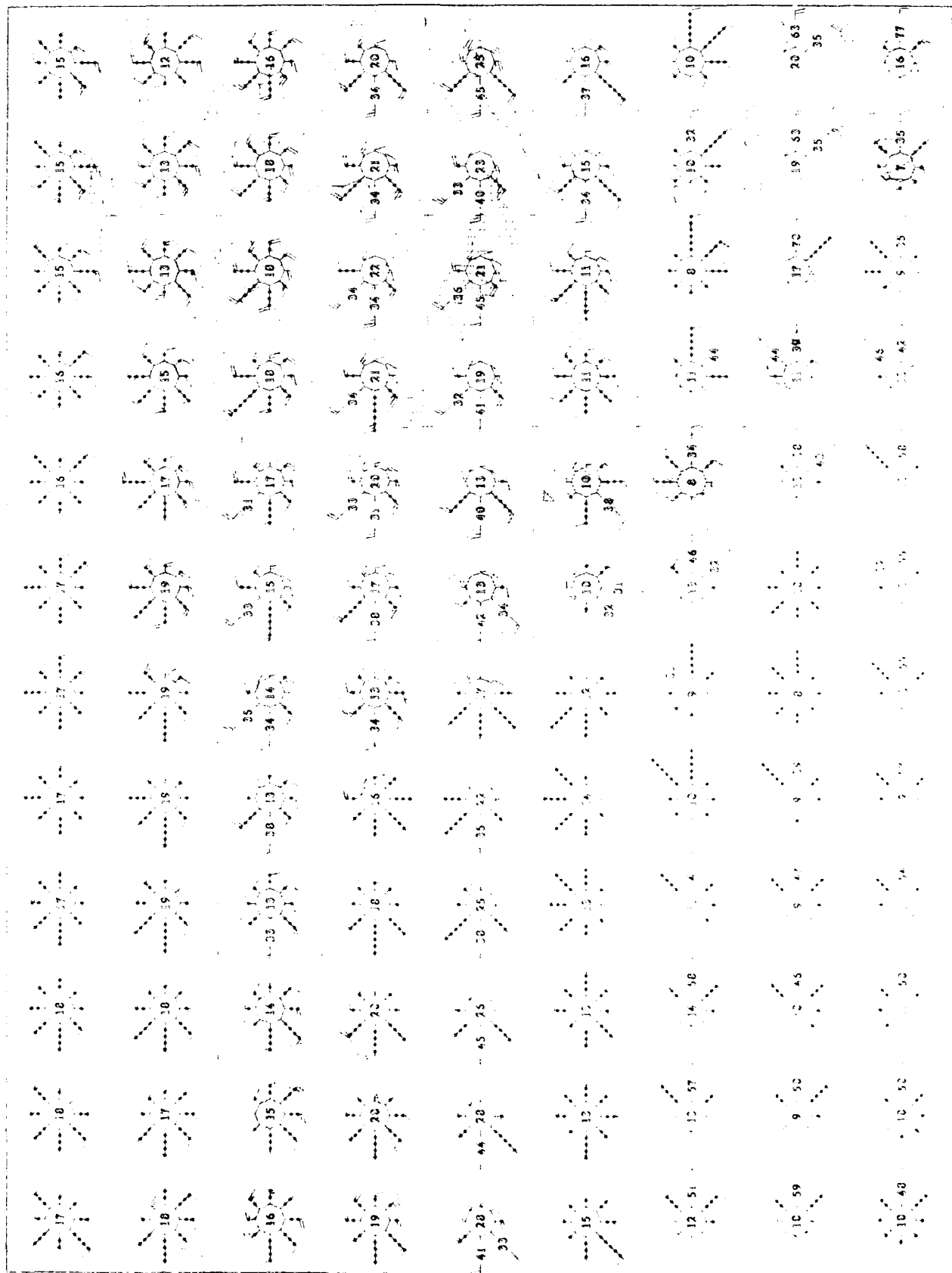




Upper Air Climatology
 Geophysical Hypotheses

1. Introduction
 2. Theoretical Background
 3. Observational Evidence
 4. Conclusions

1967
 700 pp.



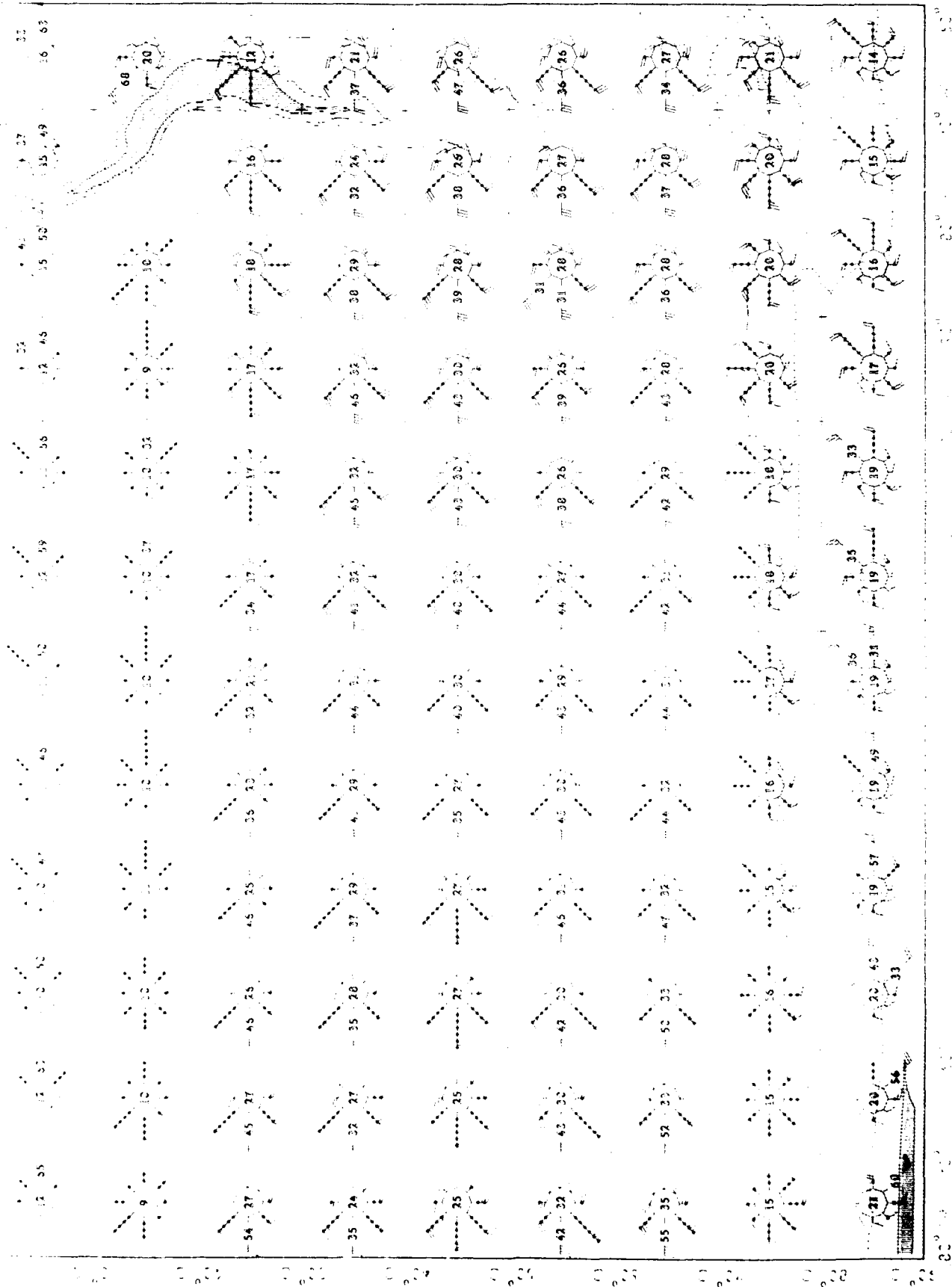
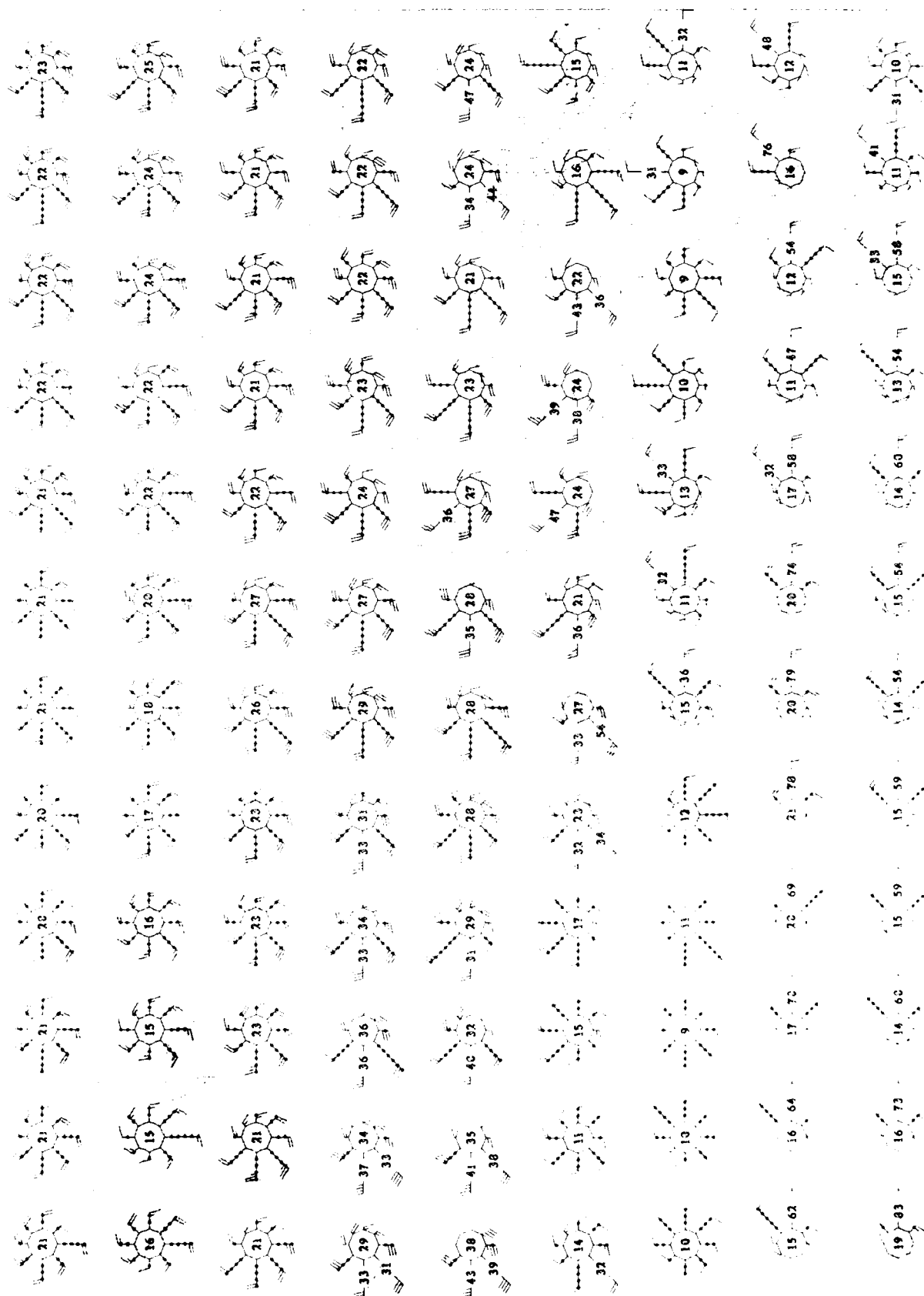
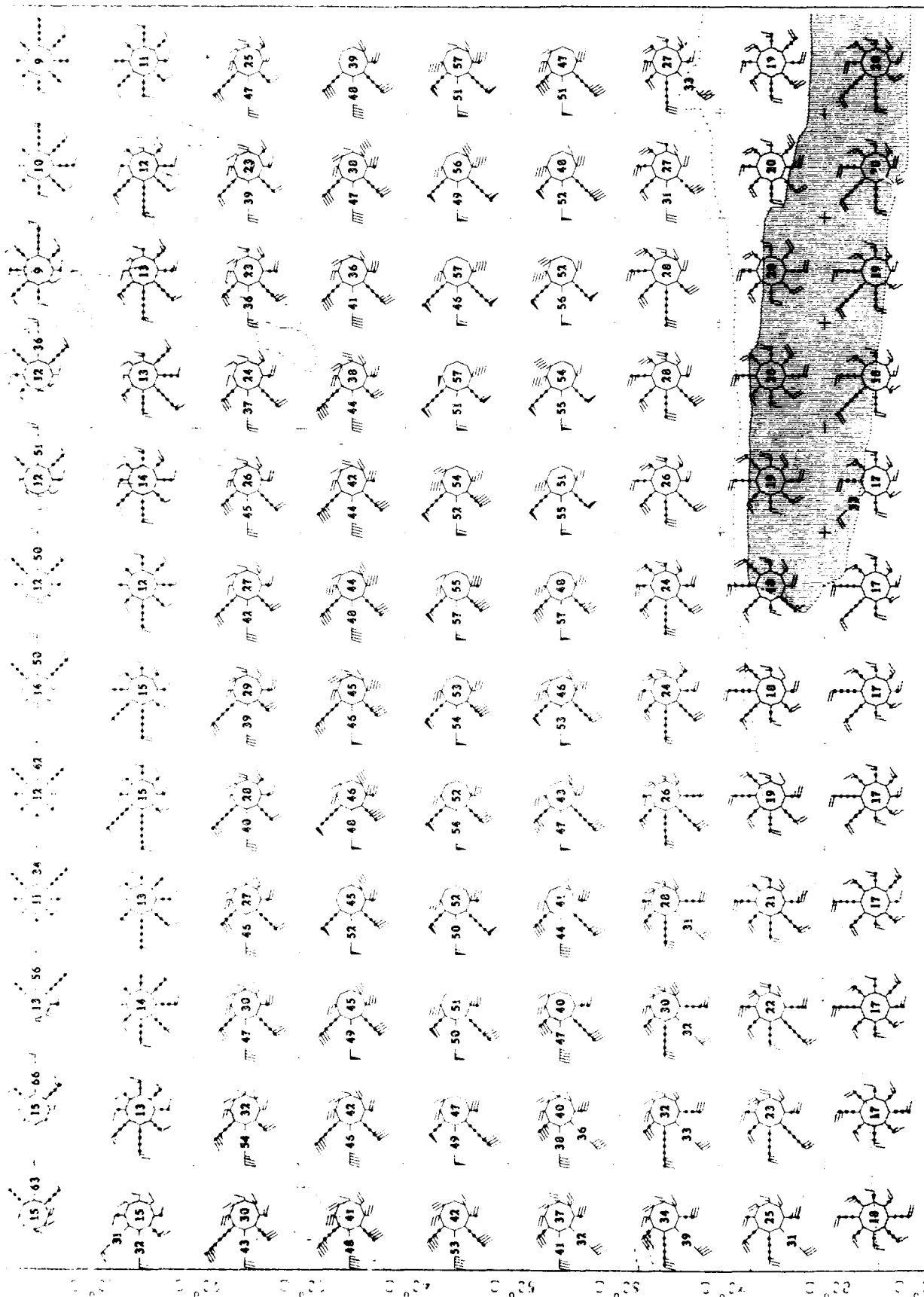


Fig. 22. Air circulation by pressure hemisphere

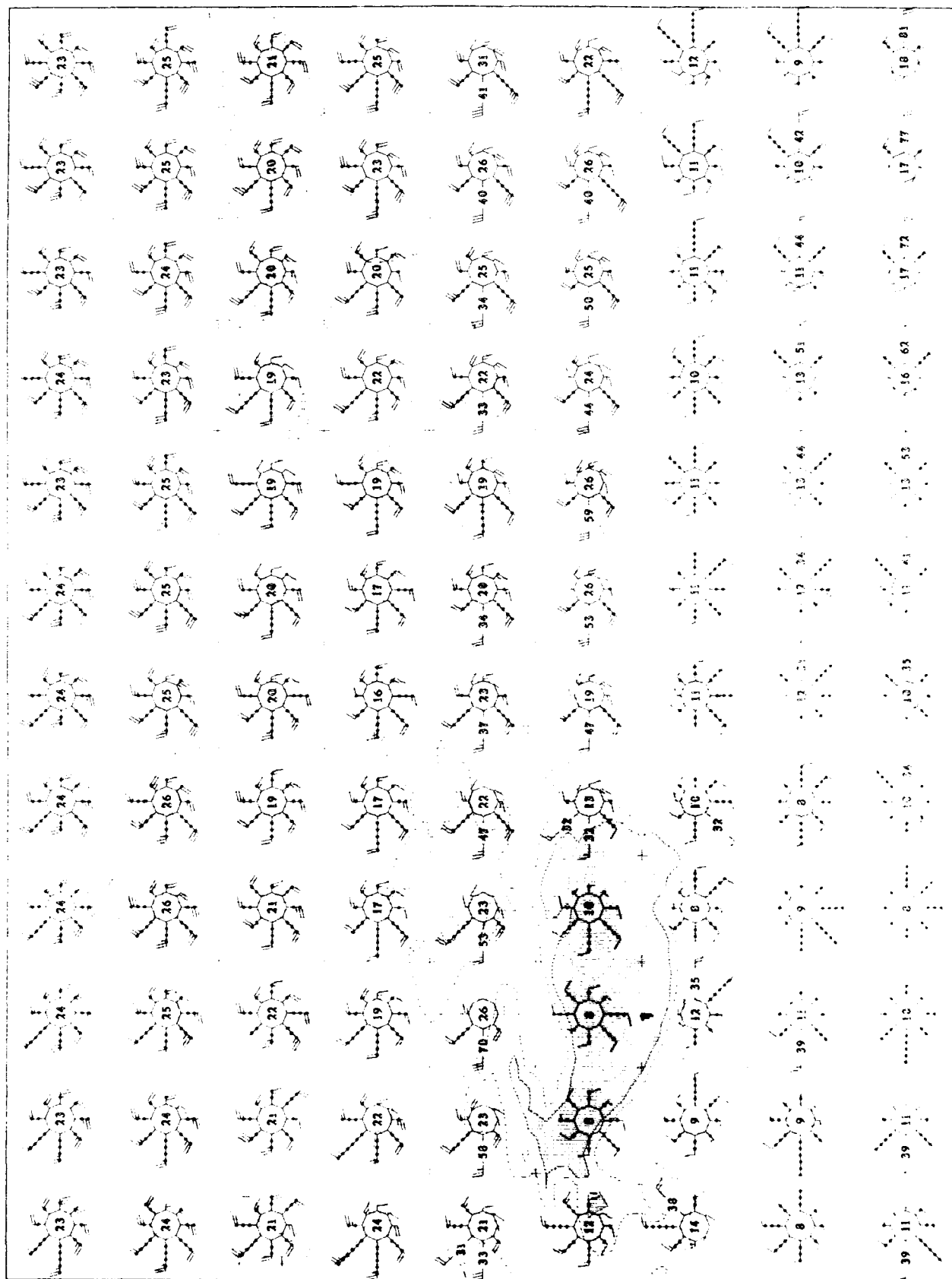


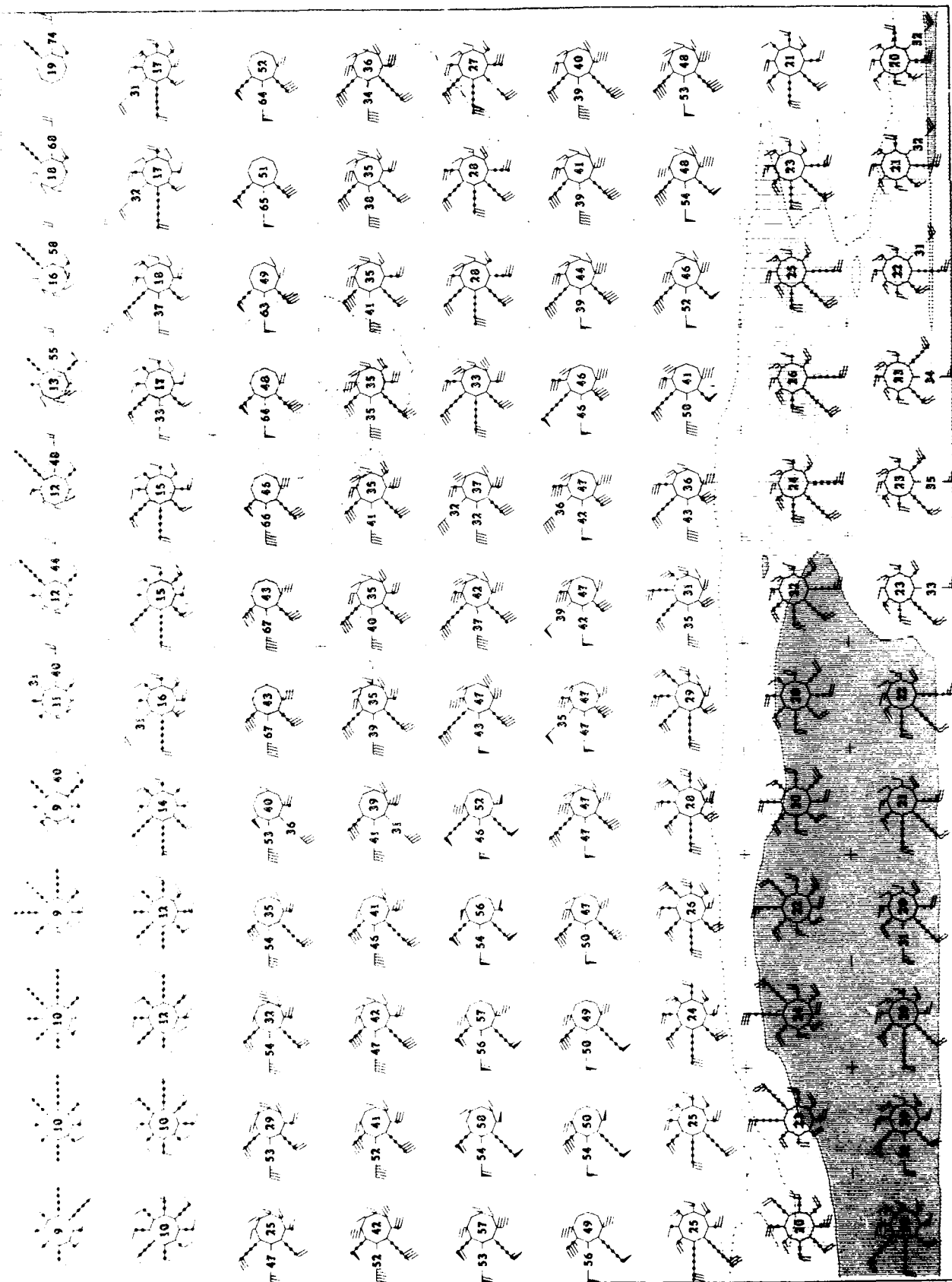


Upper Air Climatology
Southern Hemisphere

500 mb
700 mb

July
500 mb





Upper Air Climatology
Southern Hemisphere

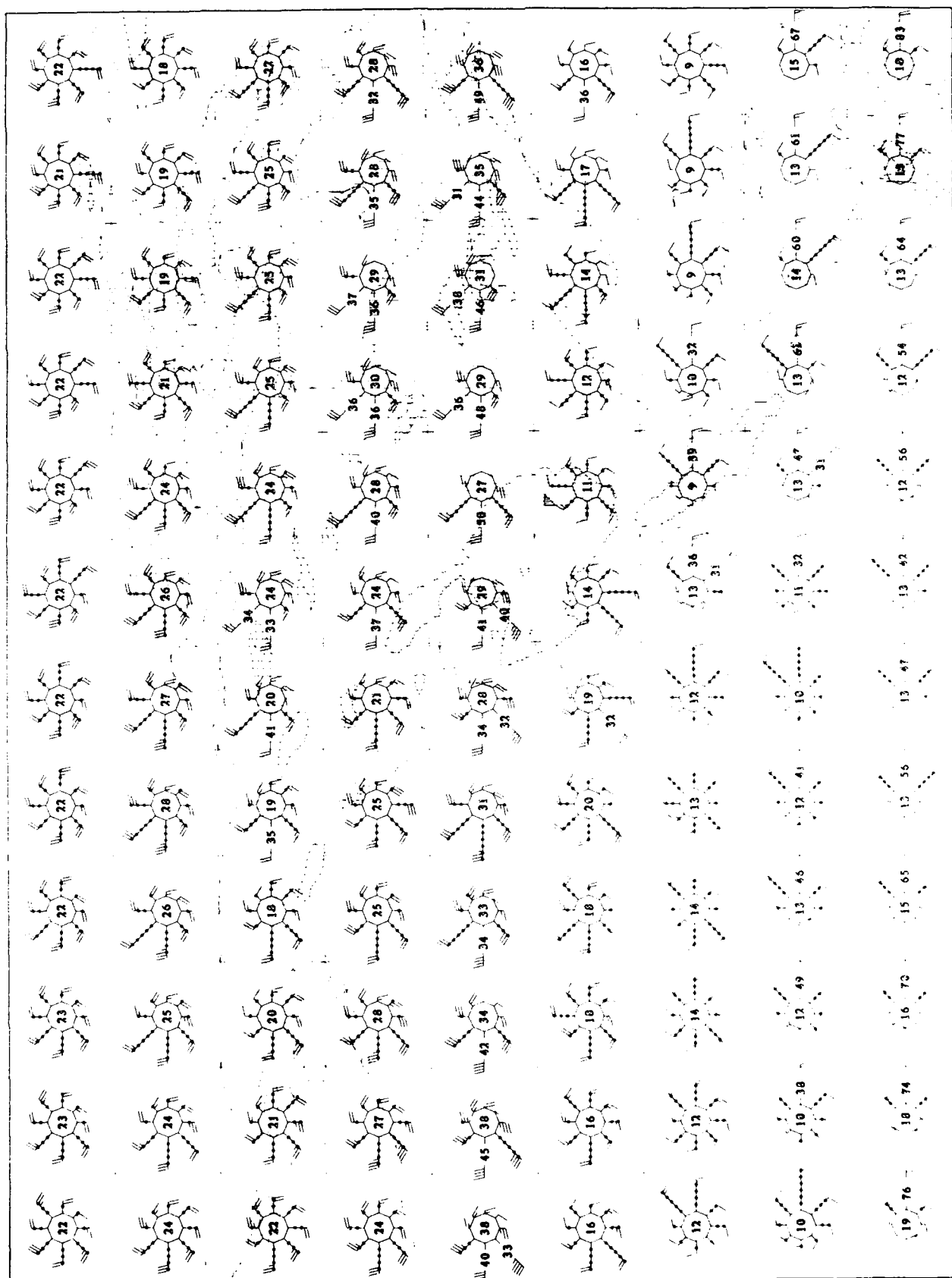
July 1952-53
500 mb

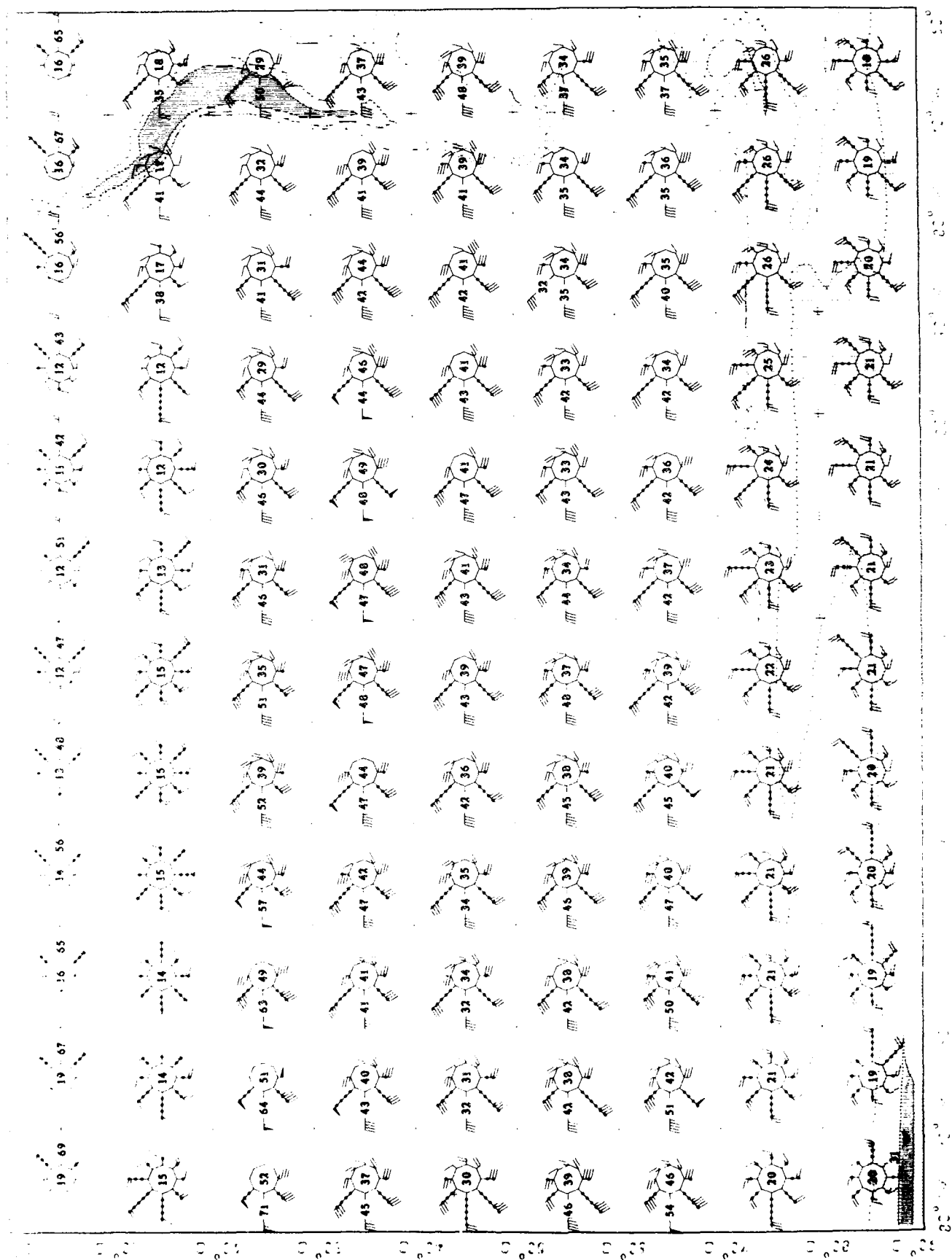
July
500 mb

Upper Air Climatology
Northern Hemisphere

2000 ft. 500 mb
Wind Roses

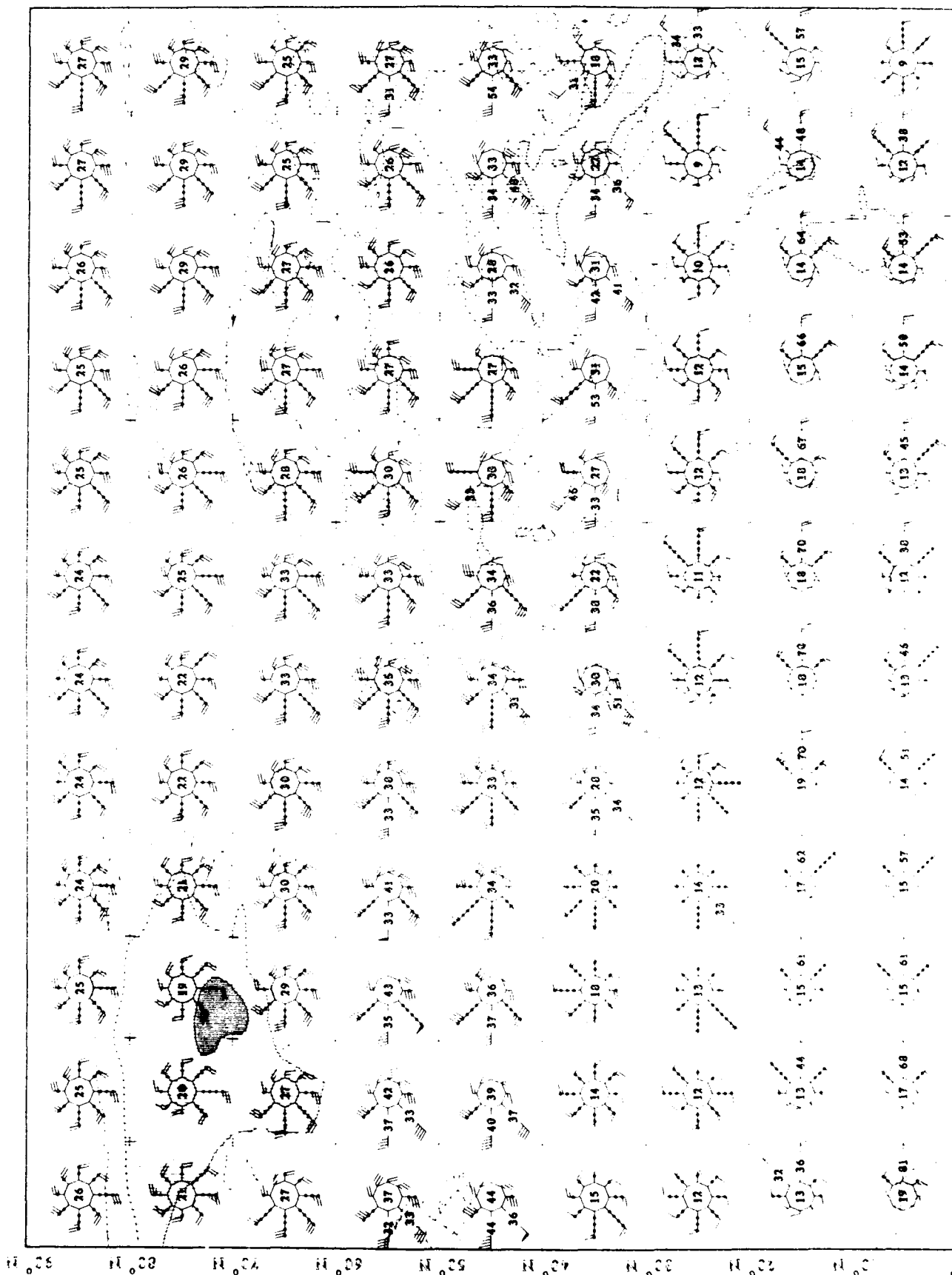
July
500 MB

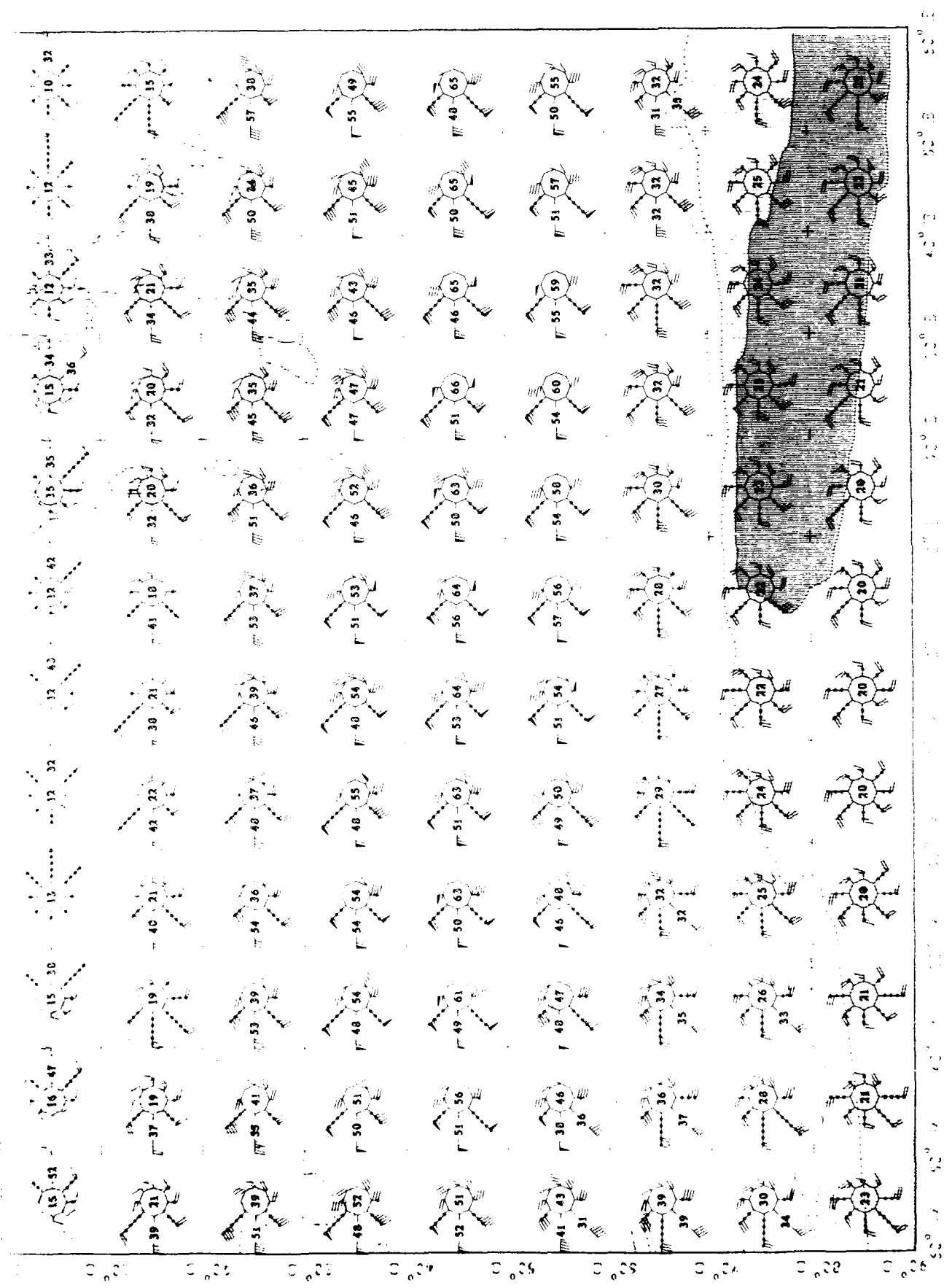




Upper Air Climatology
Southern Hemisphere

July 1969
500 mb

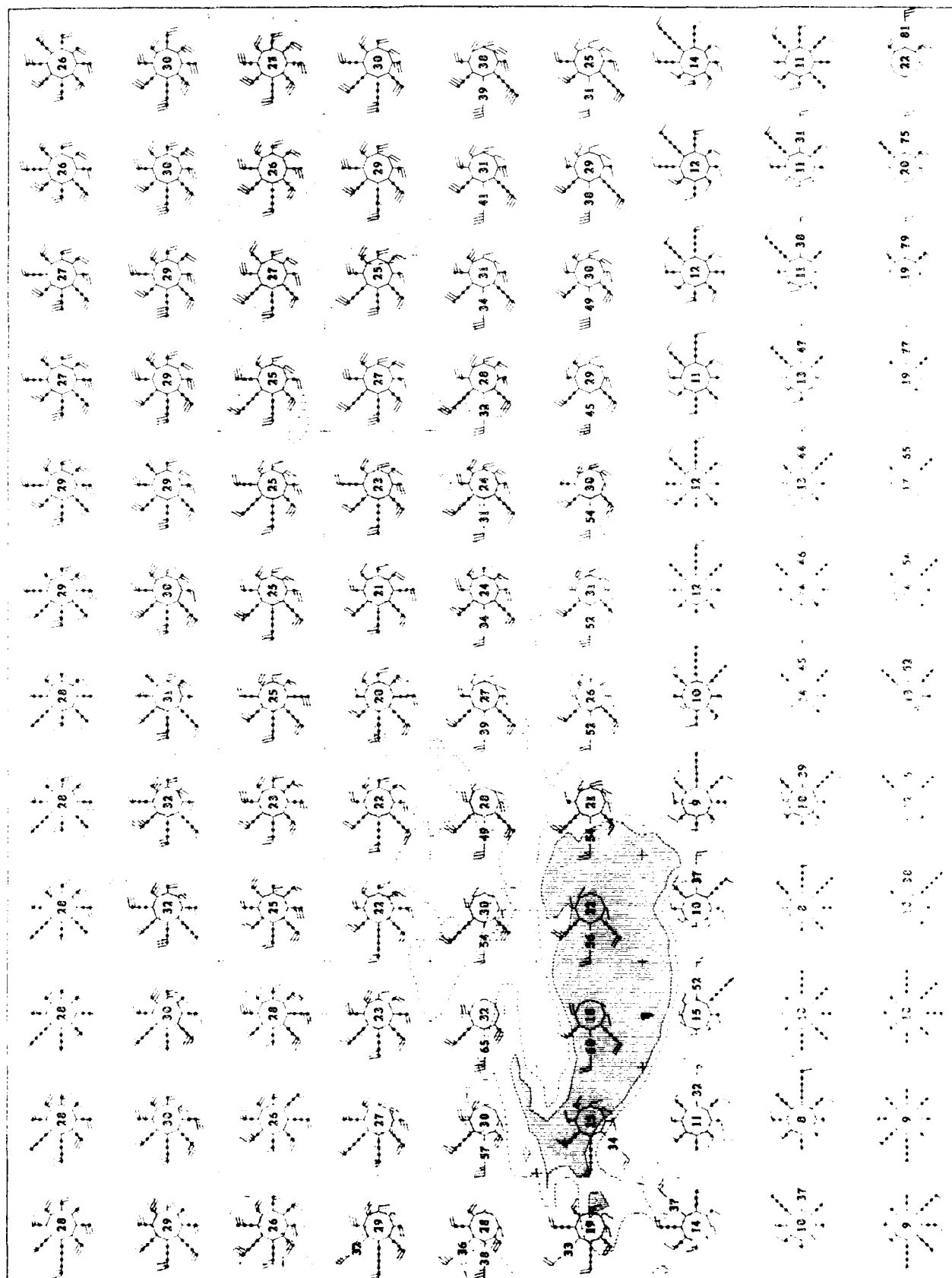


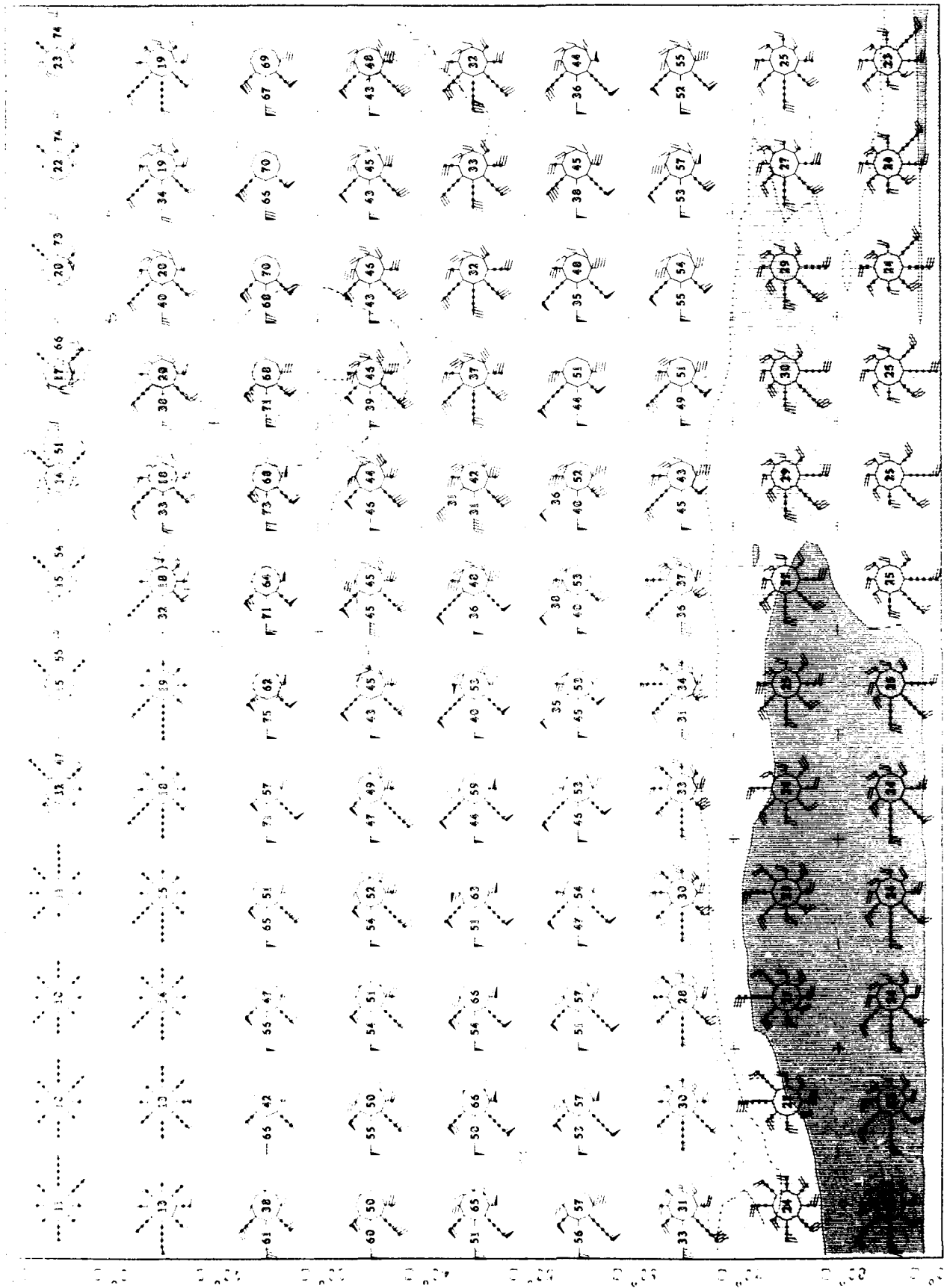


Upper Air Climatology
Southern Hemisphere

July 1963
1963-1964

July
400 mb



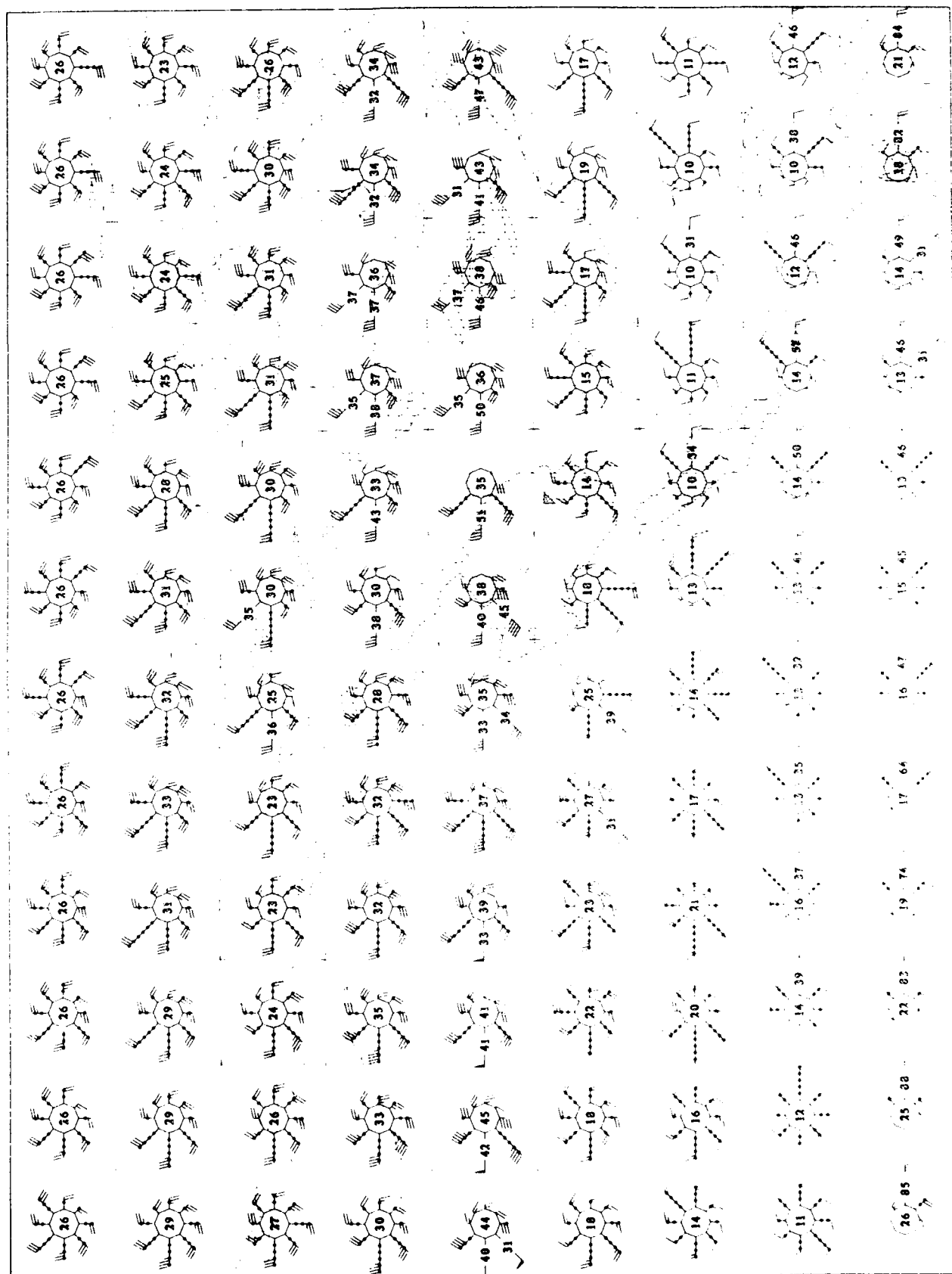


Upper Air Climatology
 Southern Hemisphere

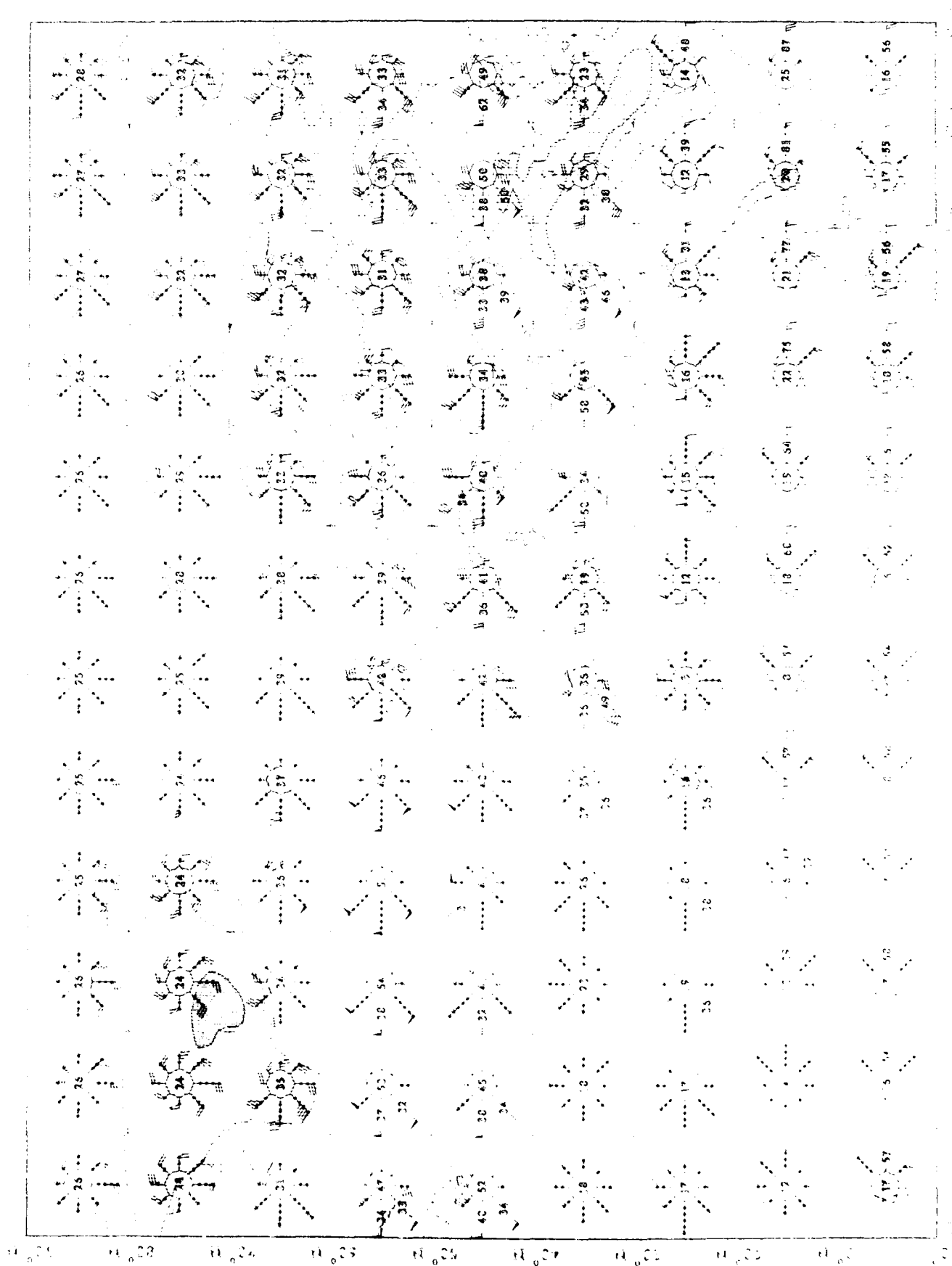
Upper Air Climatology Northern Hemisphere

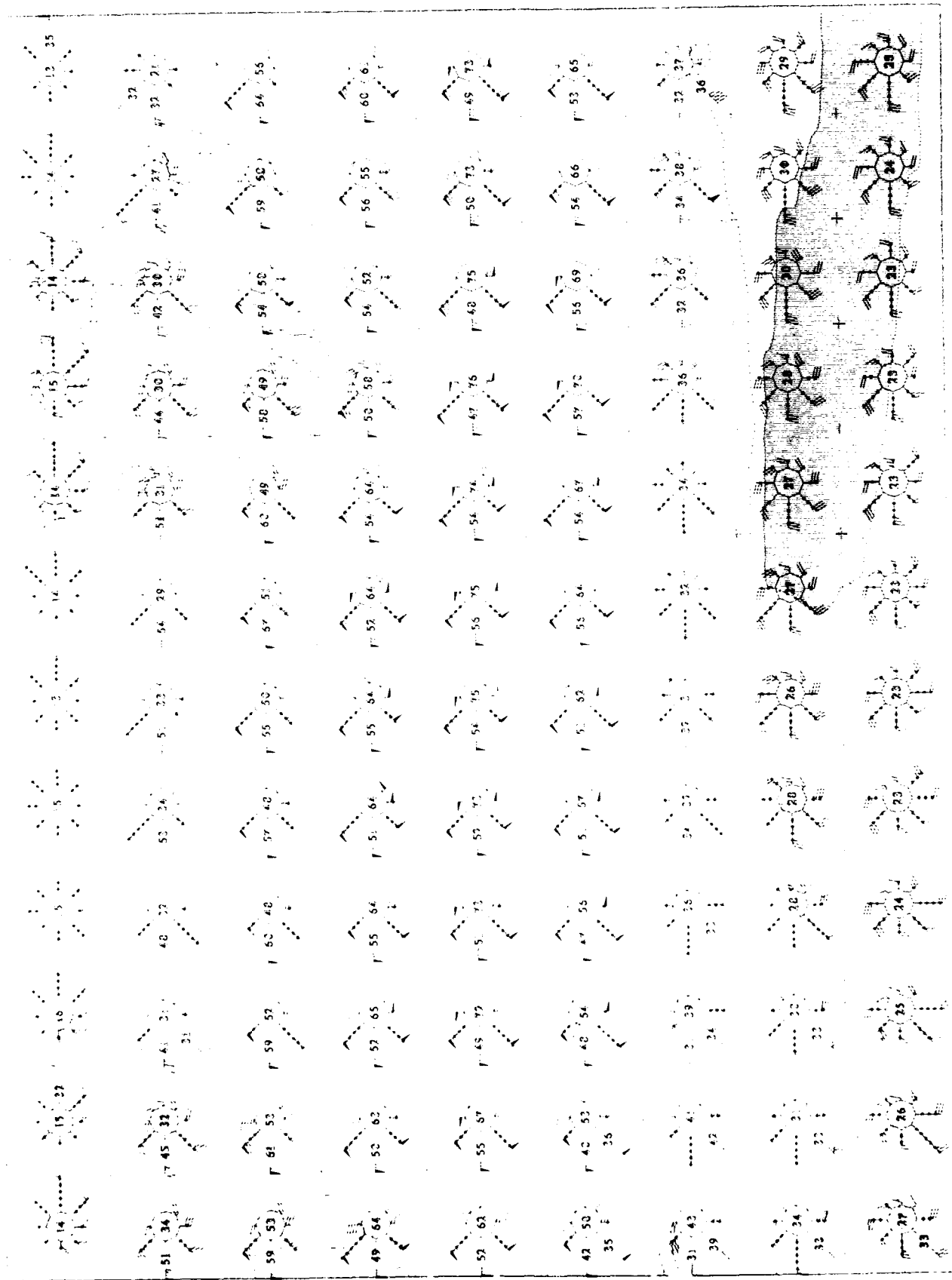
1000 mb
Wind Speed

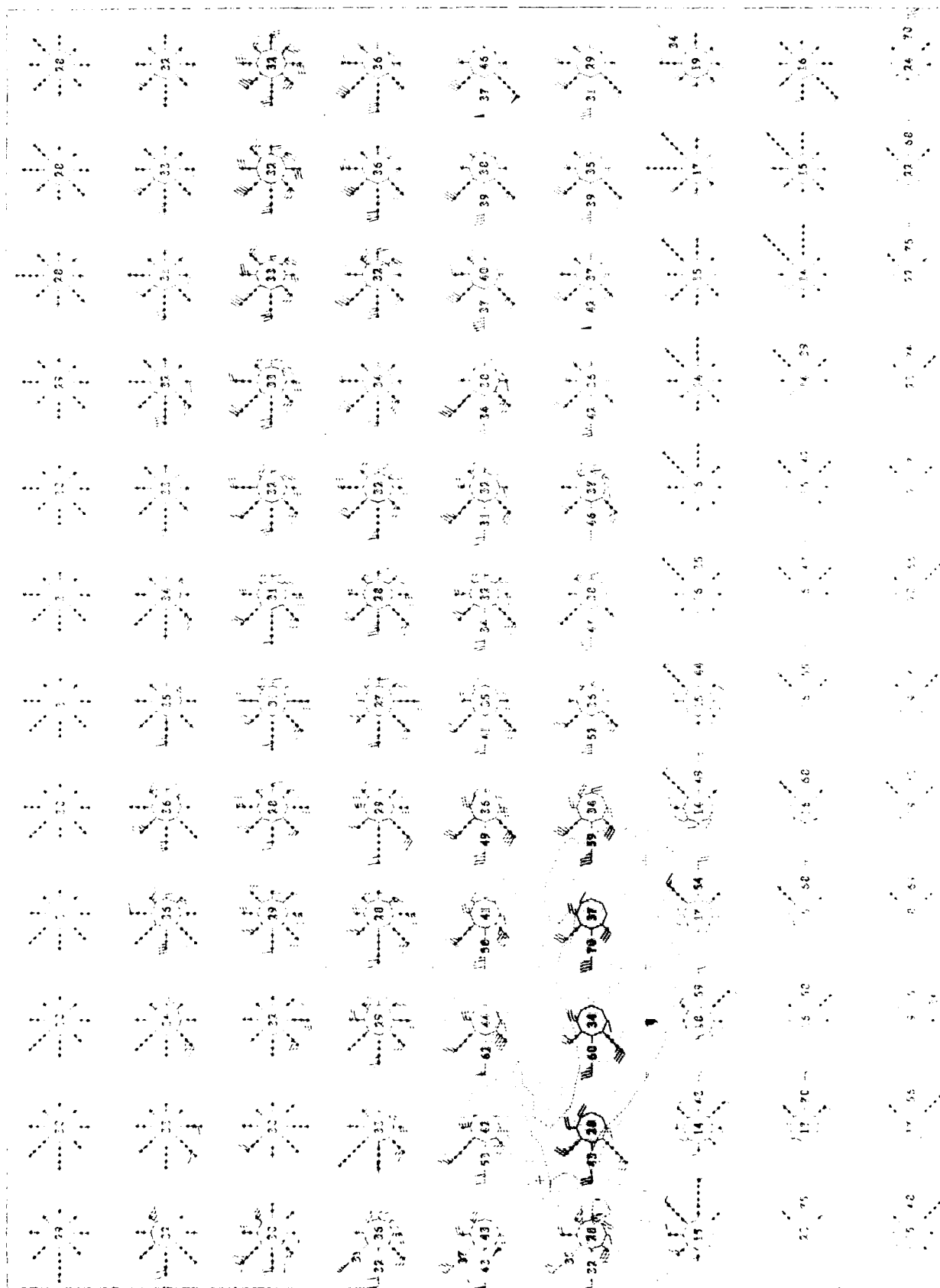
July
400 MB

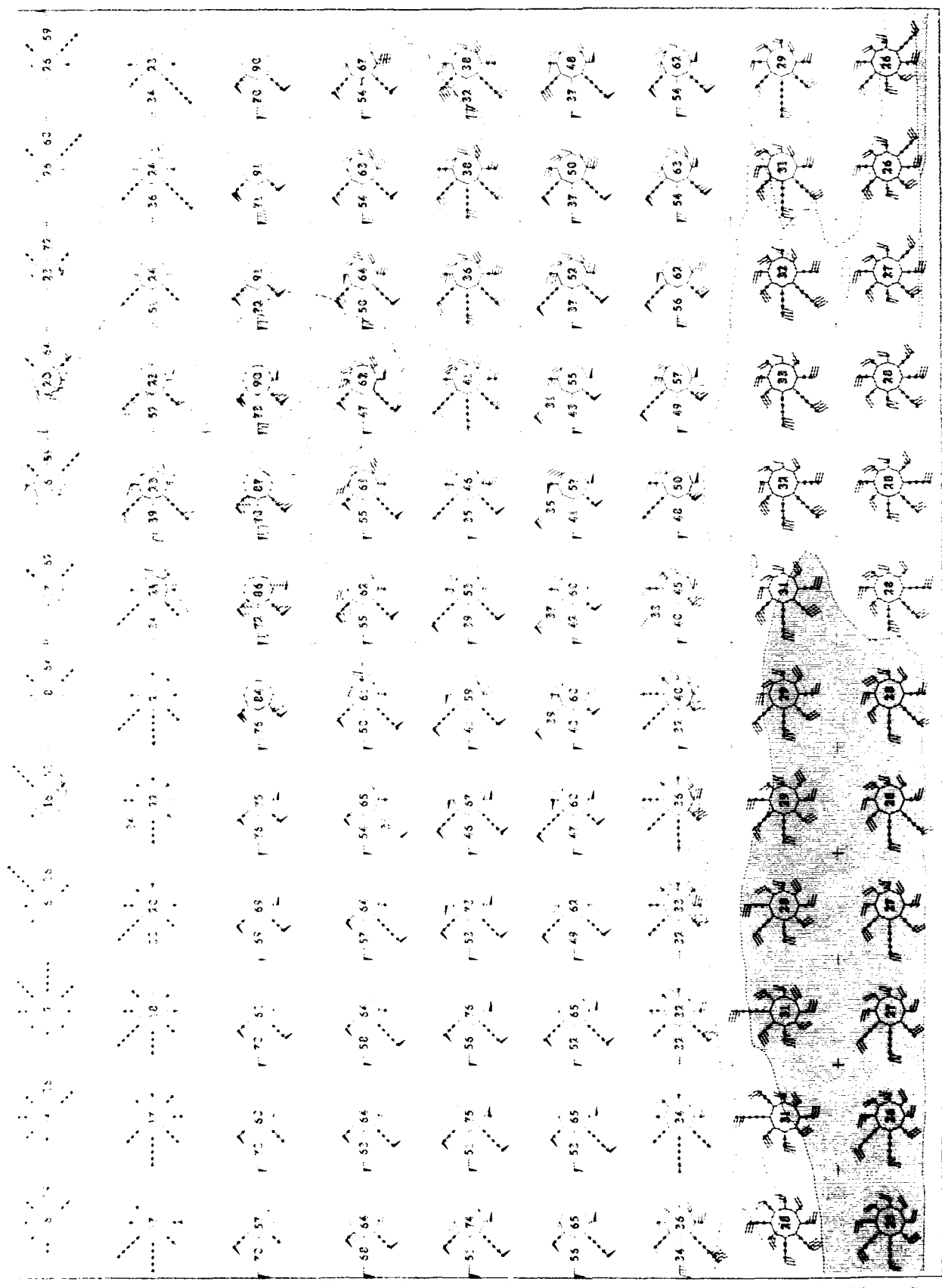




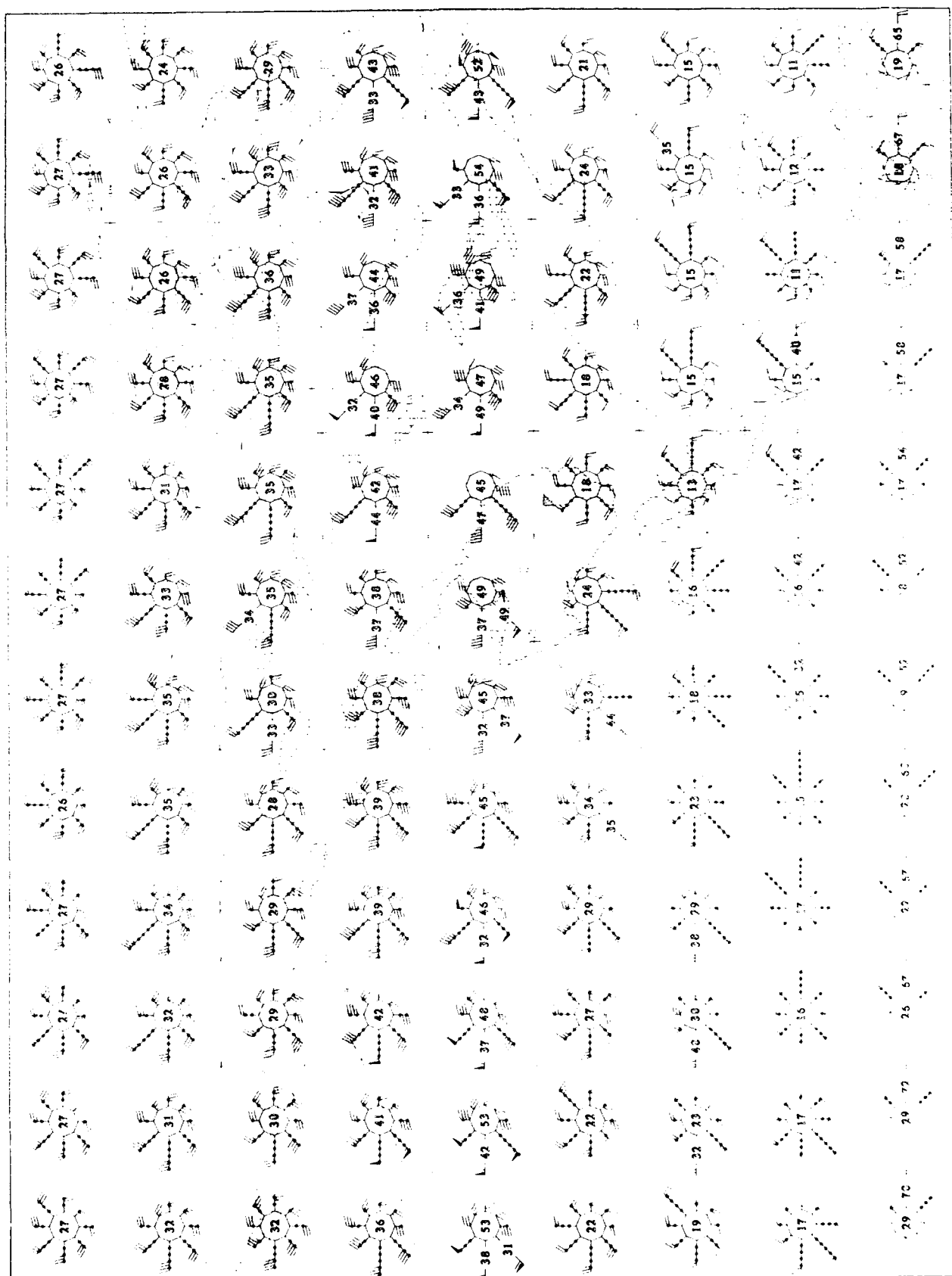








Upper and Lower
Extremities



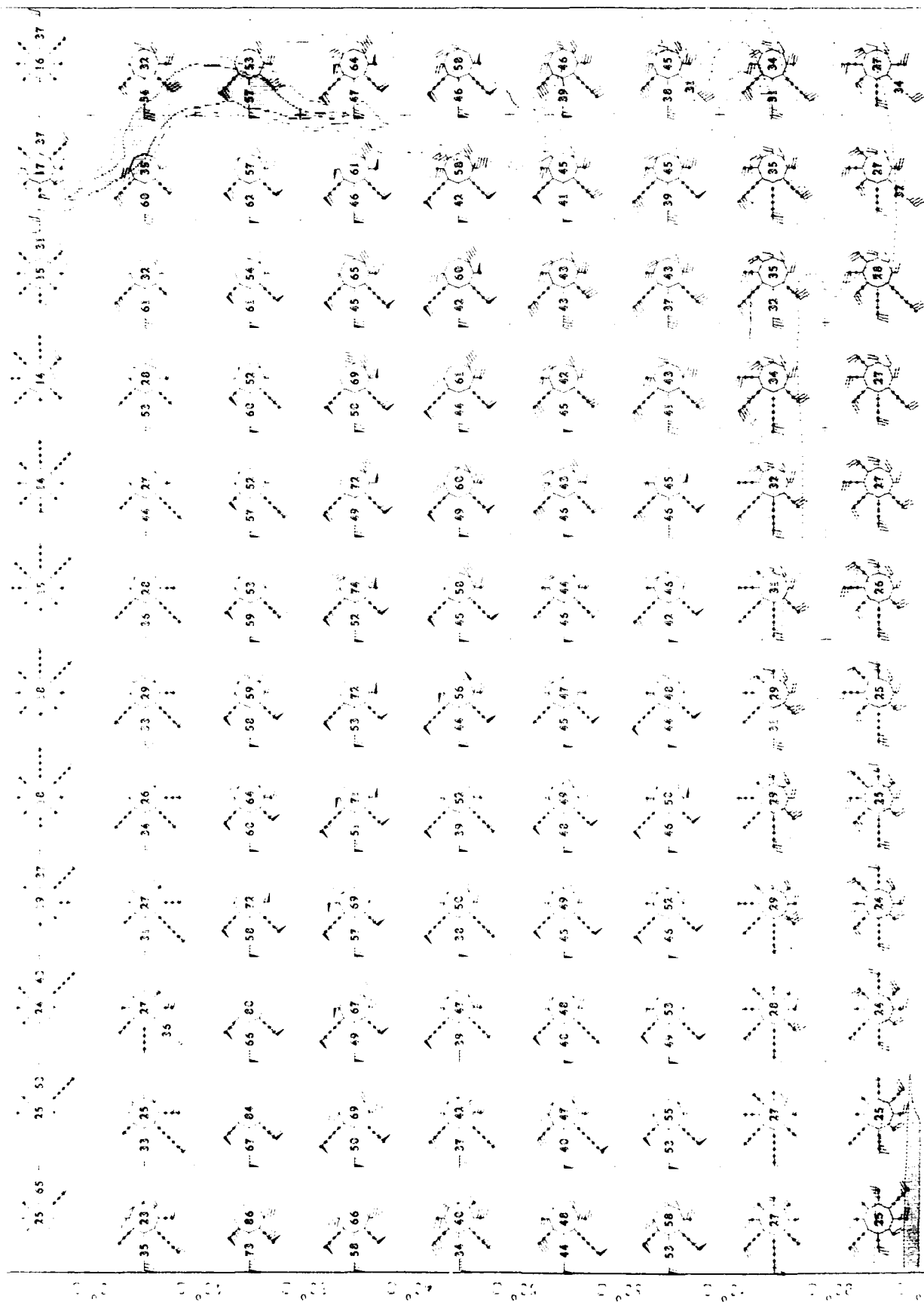
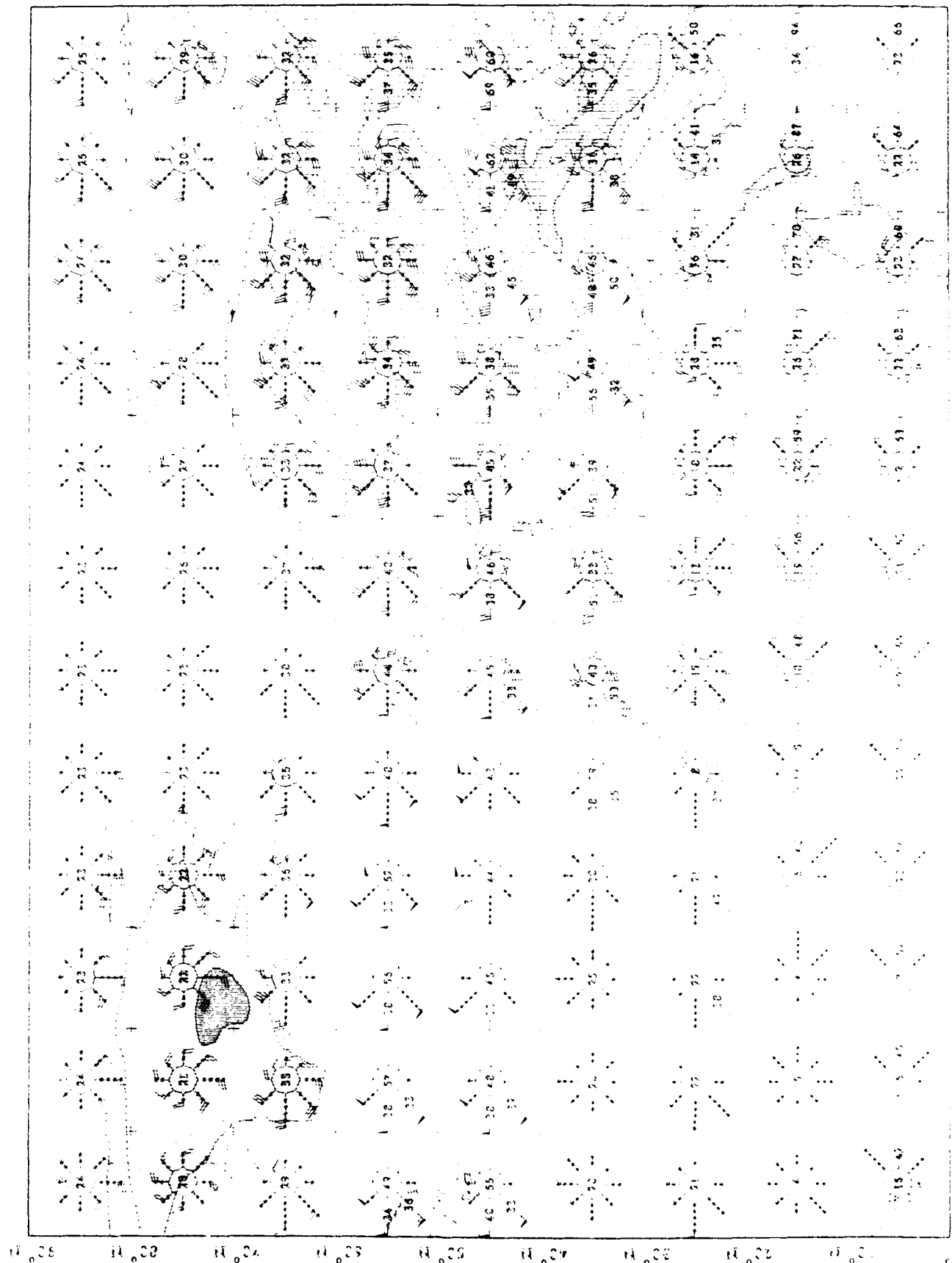
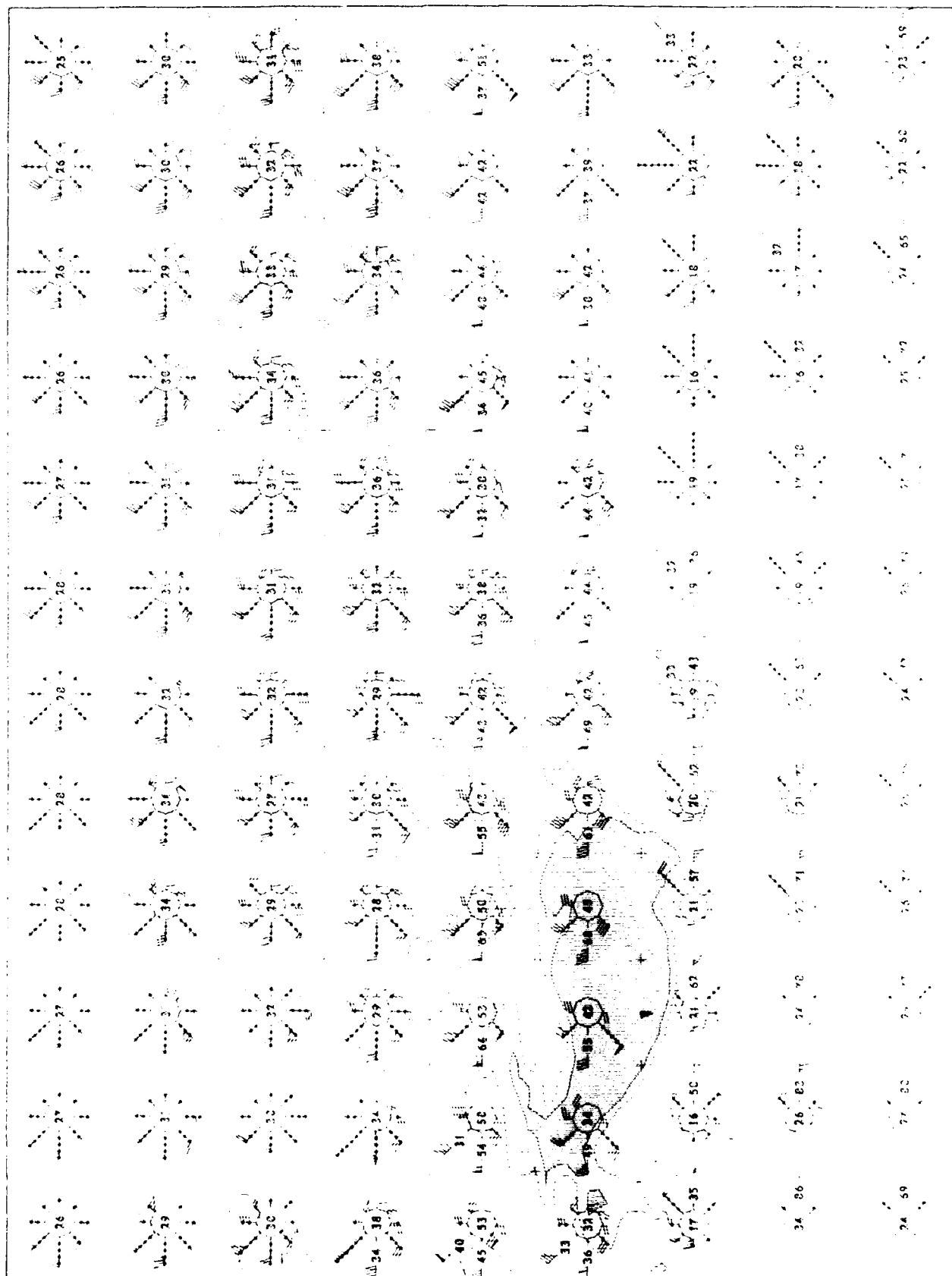
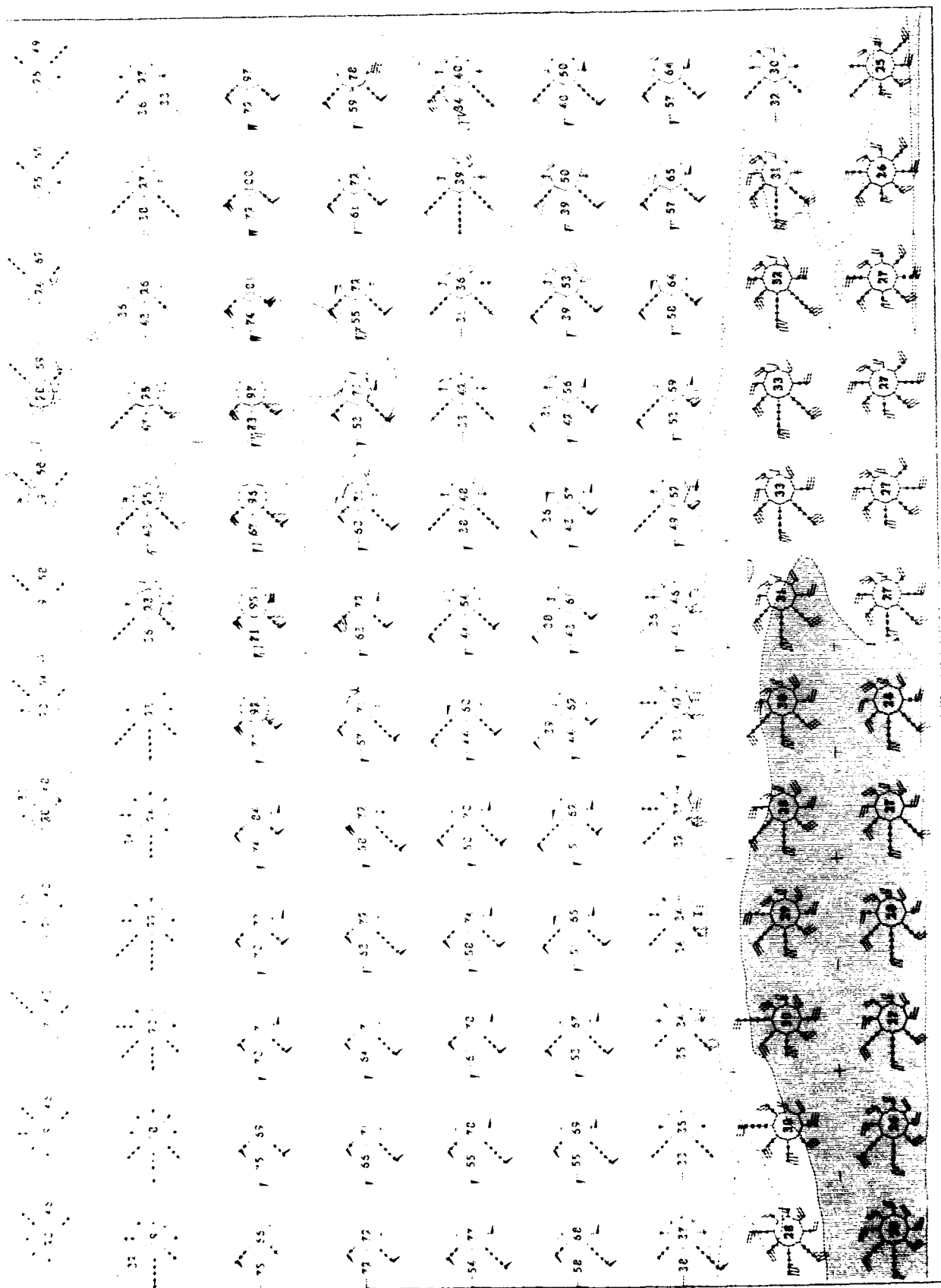


Figure 1. Stick-figure diagrams
used in the study.

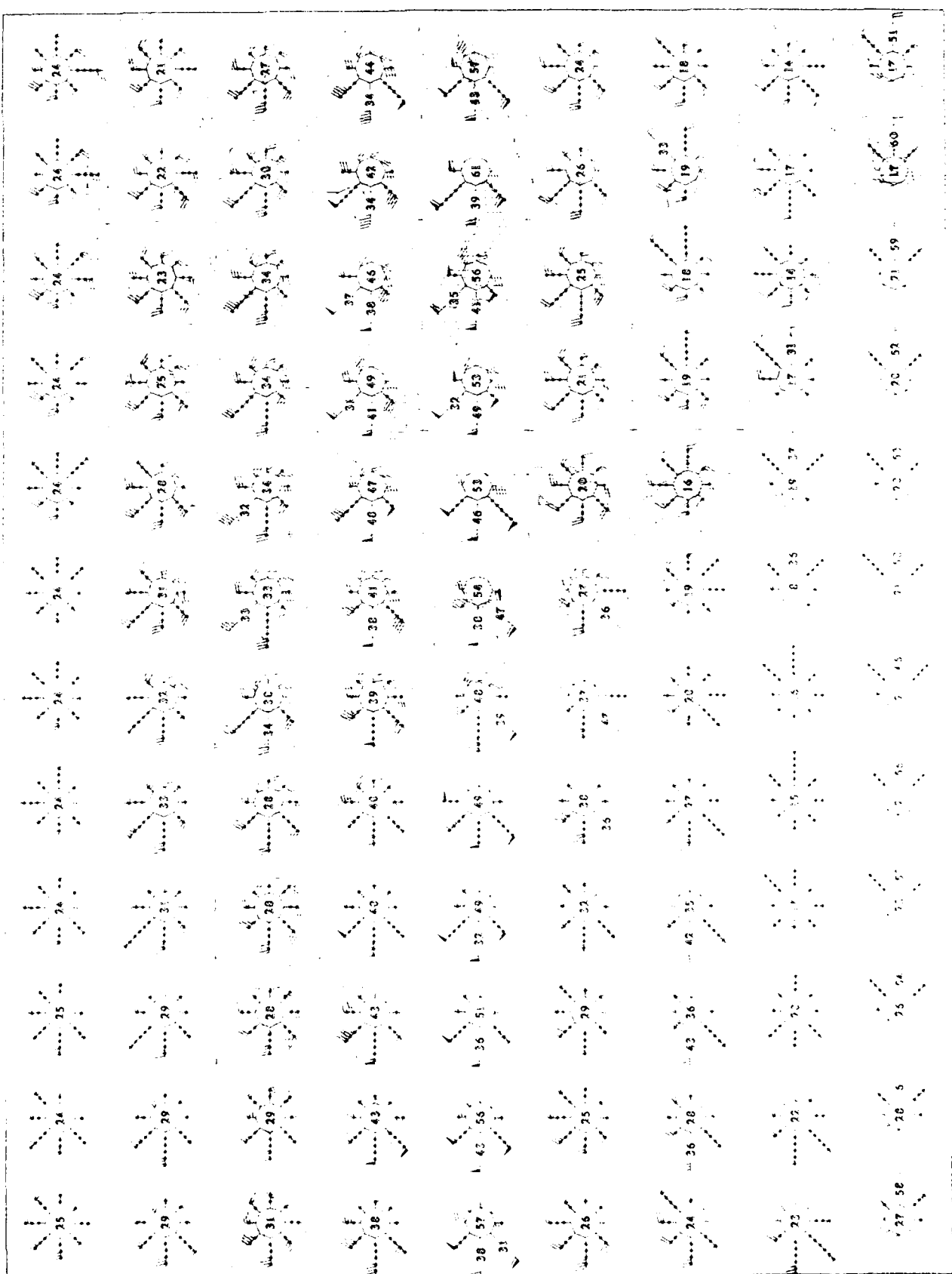
1000 ft. contour
 1000 ft. contour
 1000 ft. contour

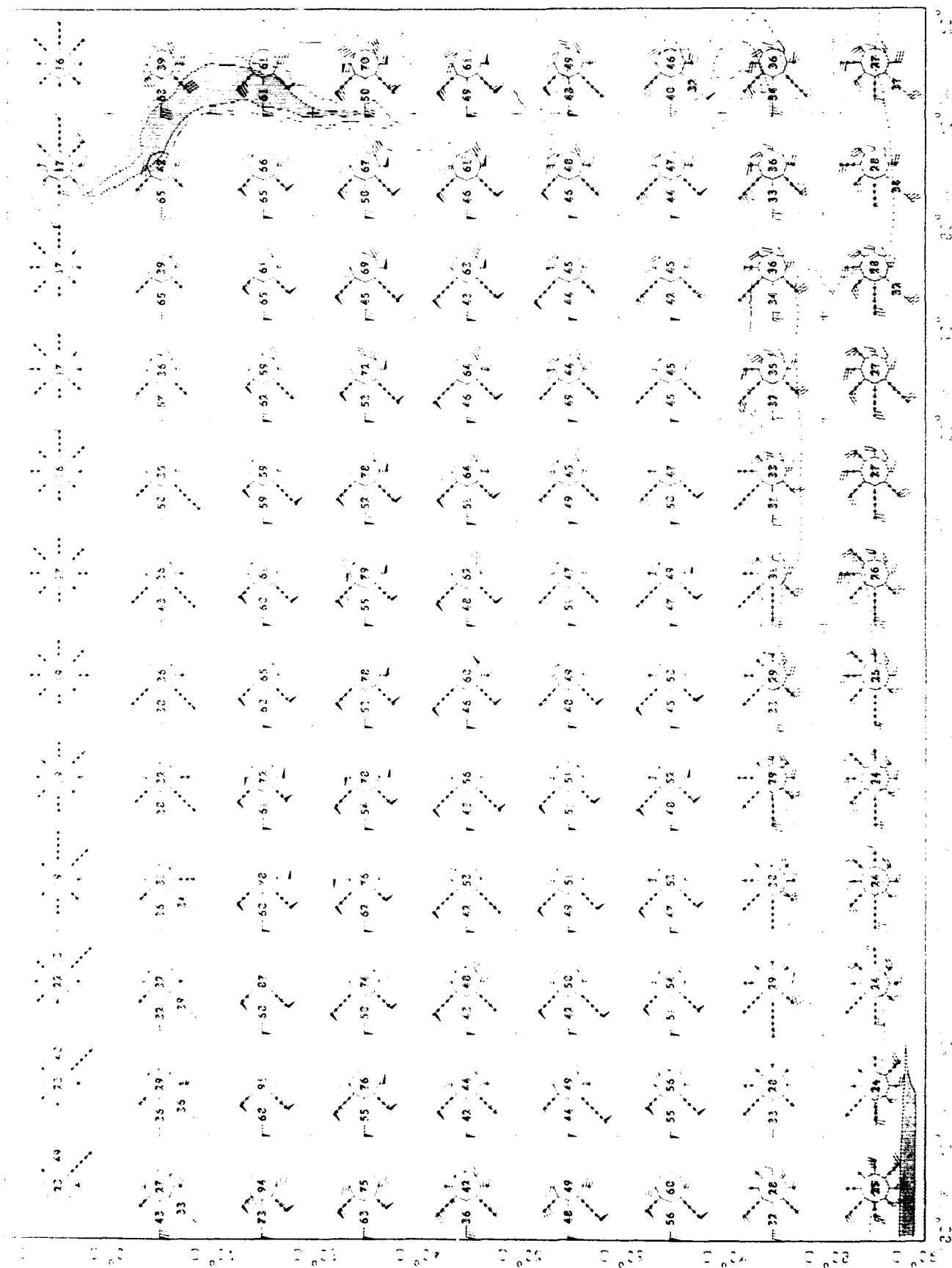


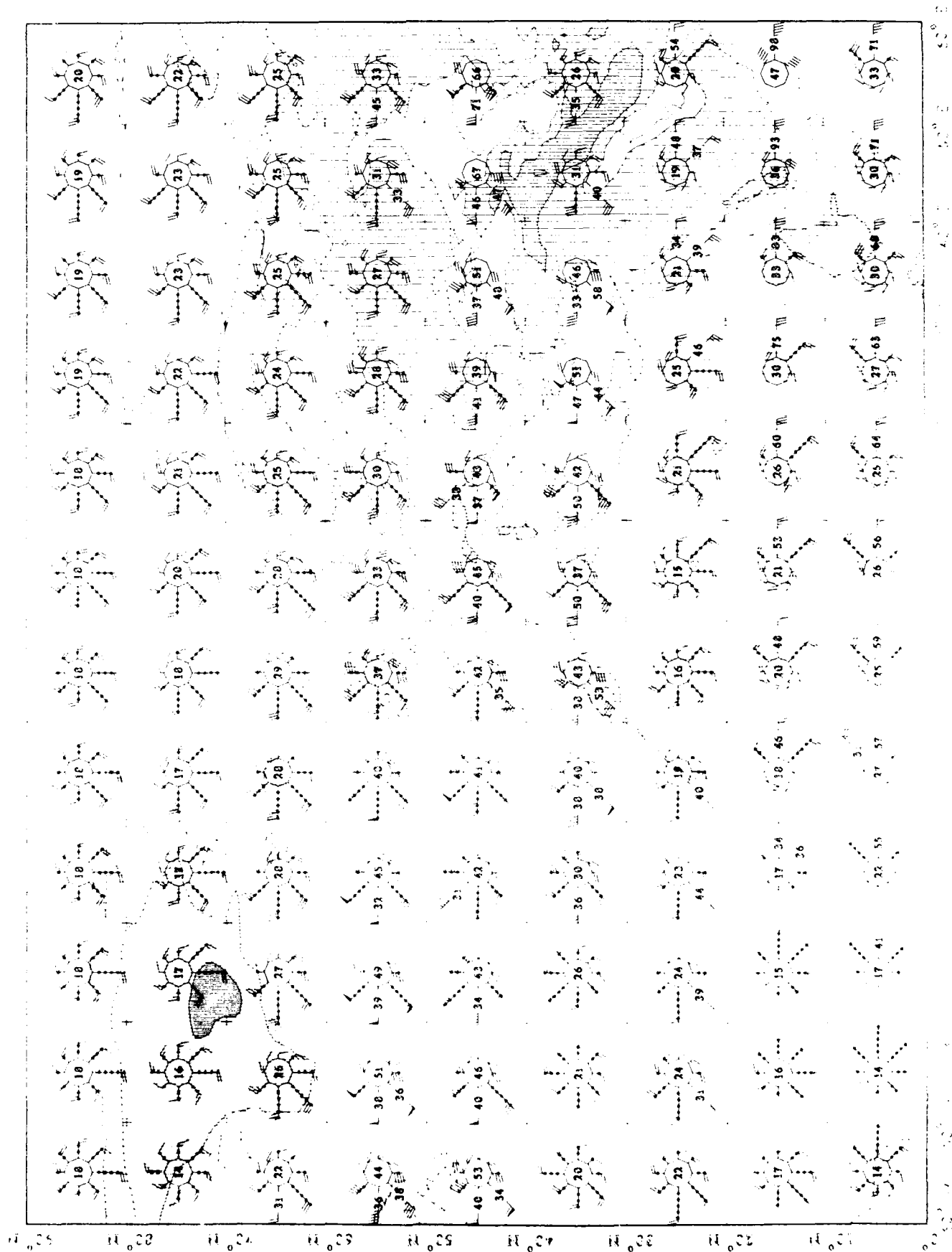


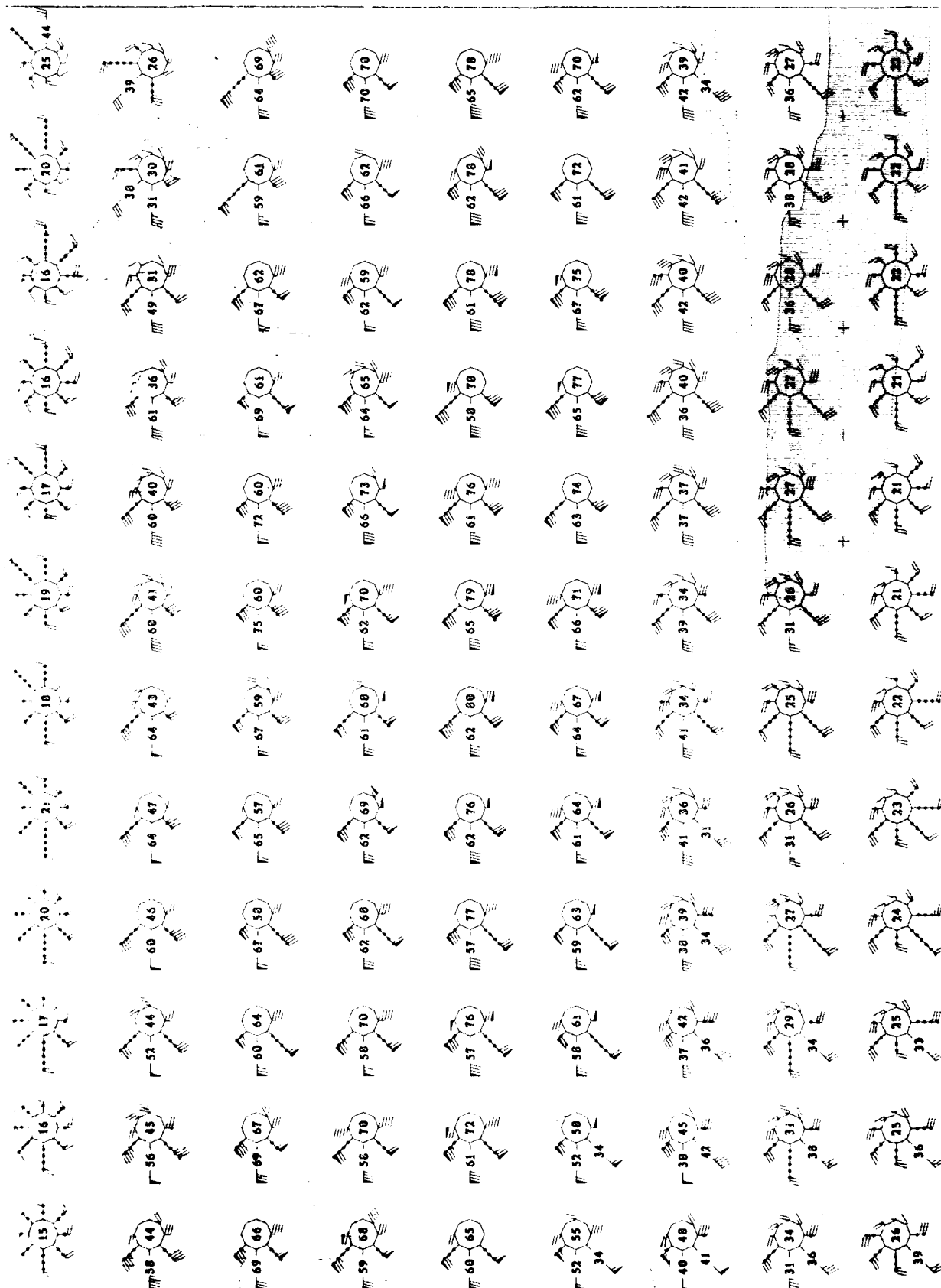


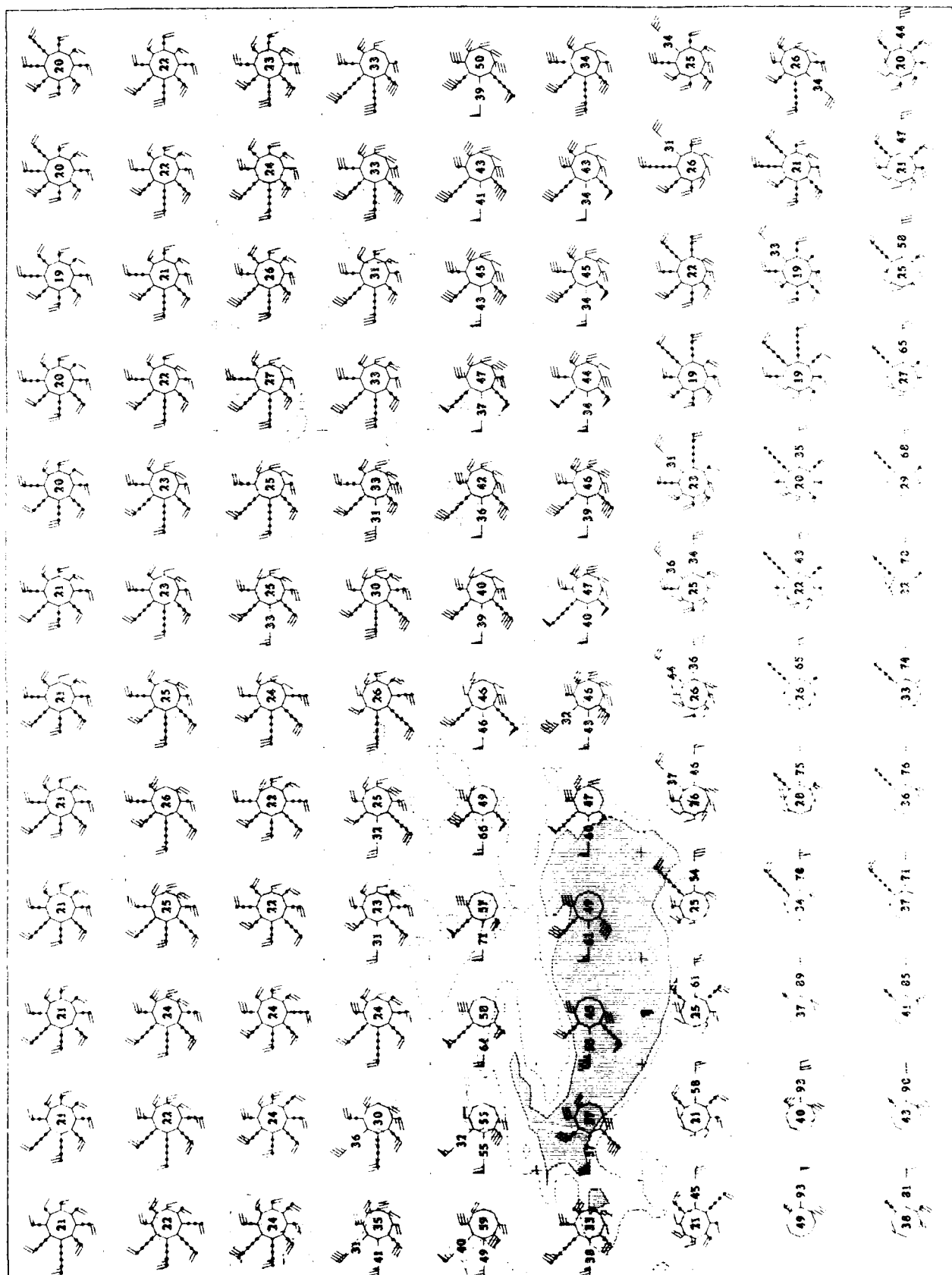
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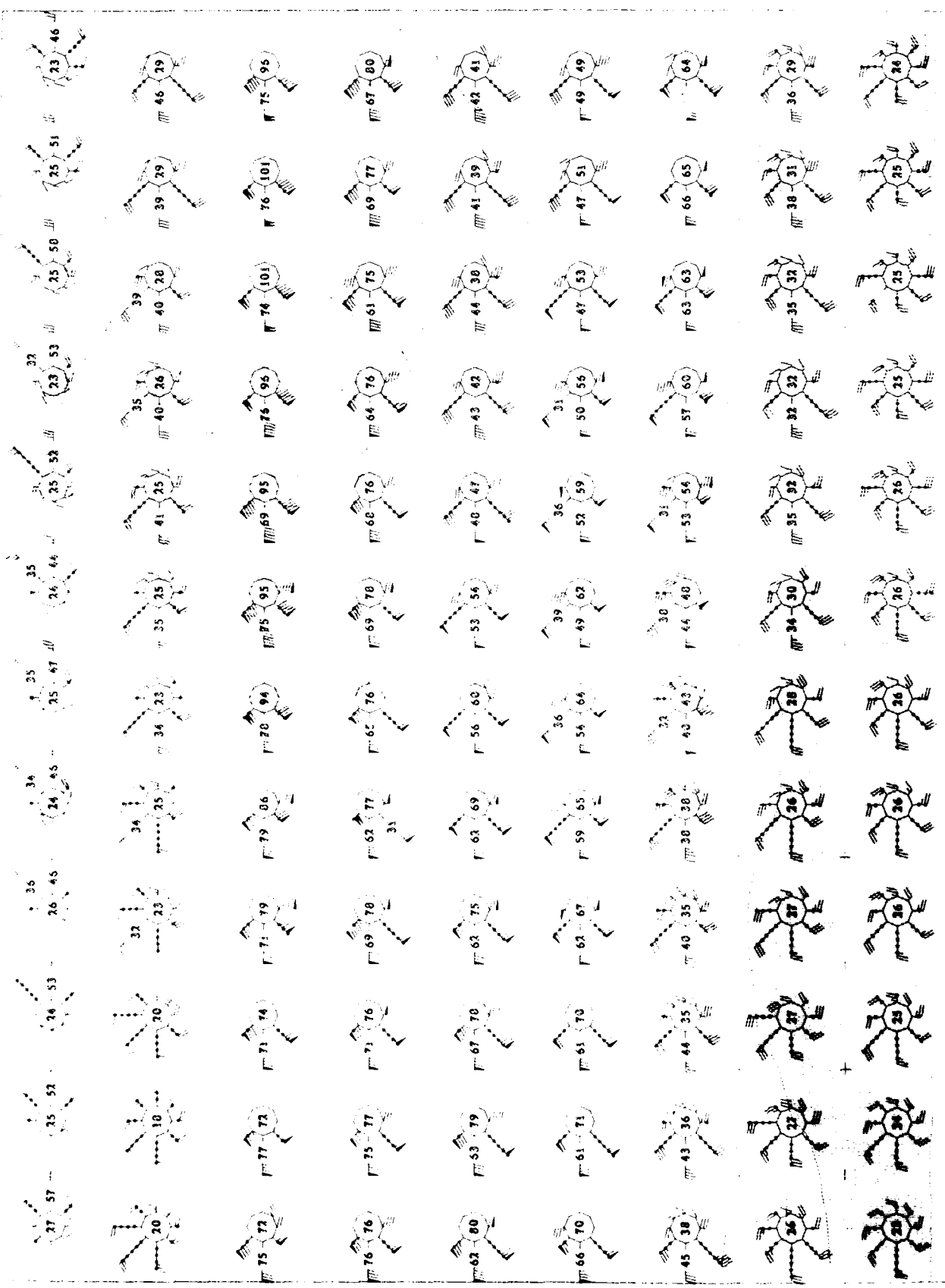




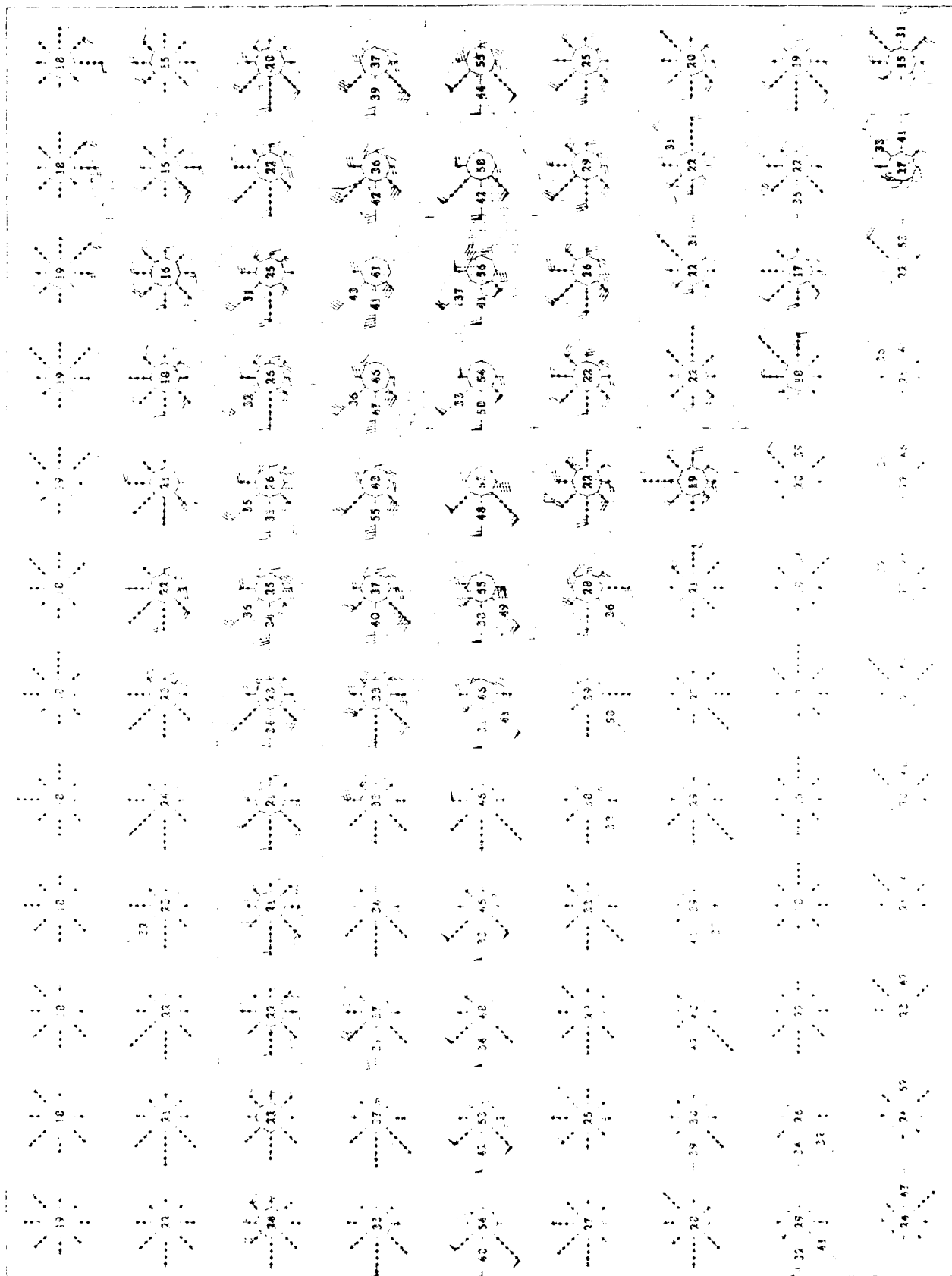


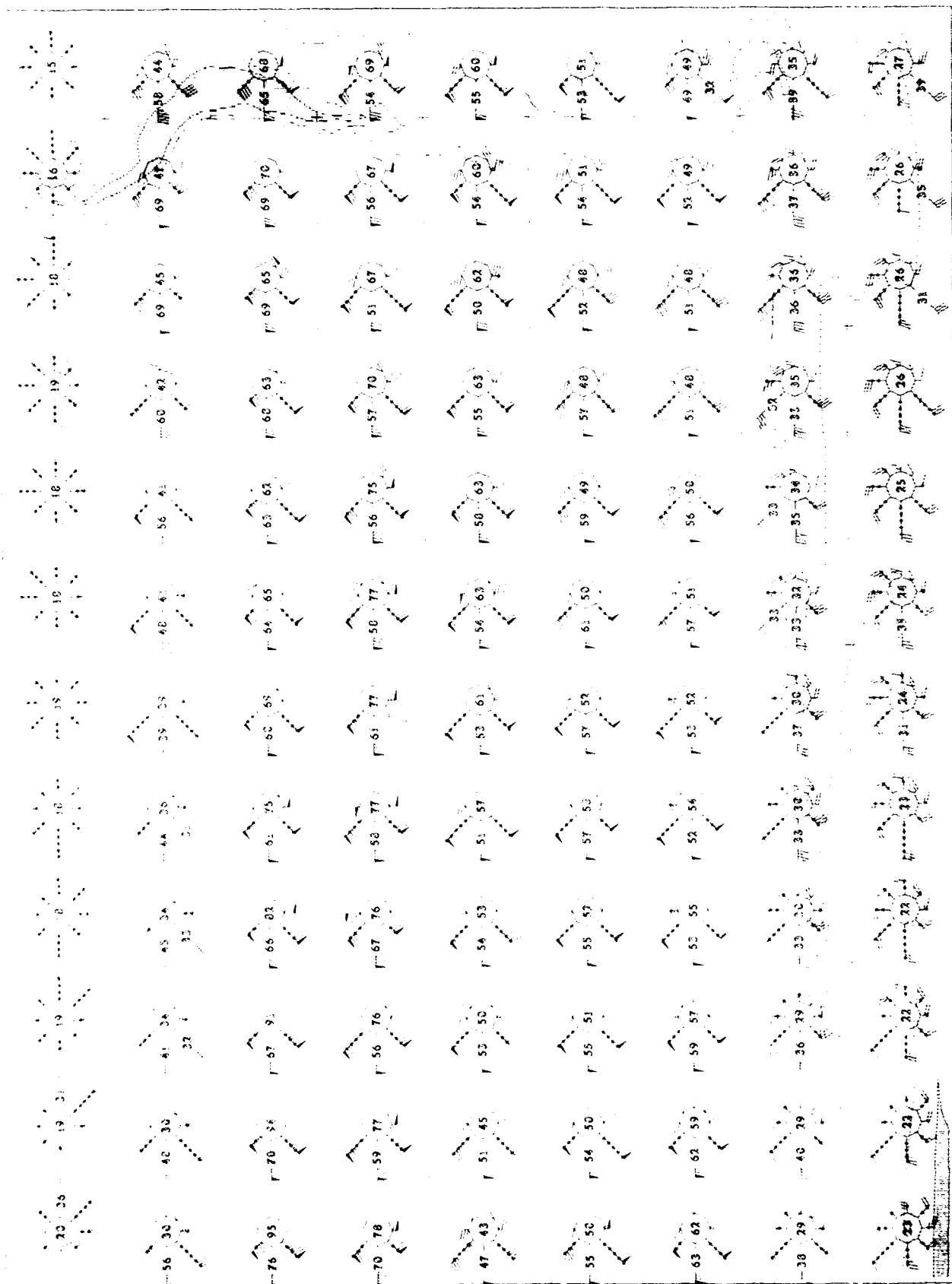




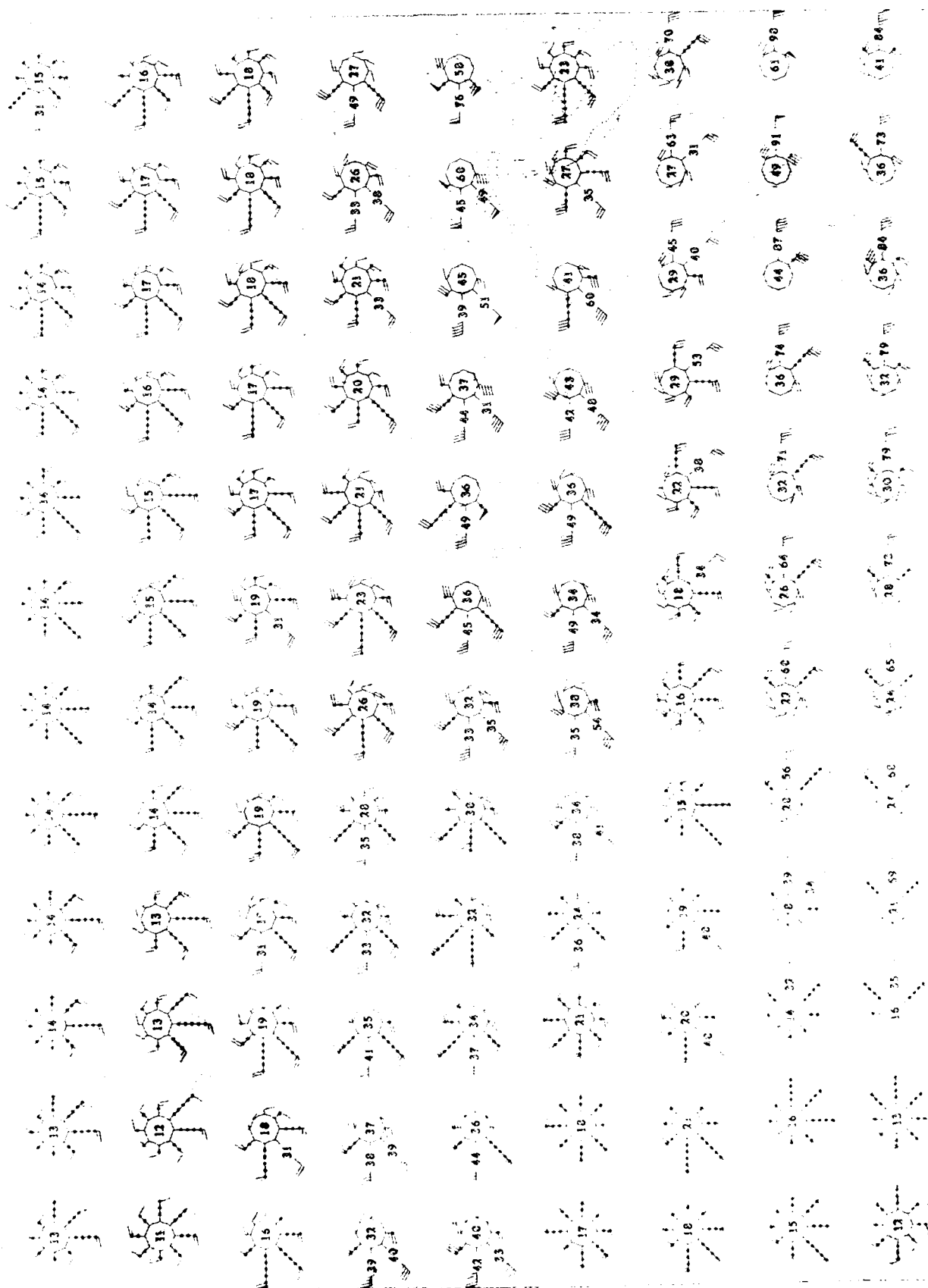


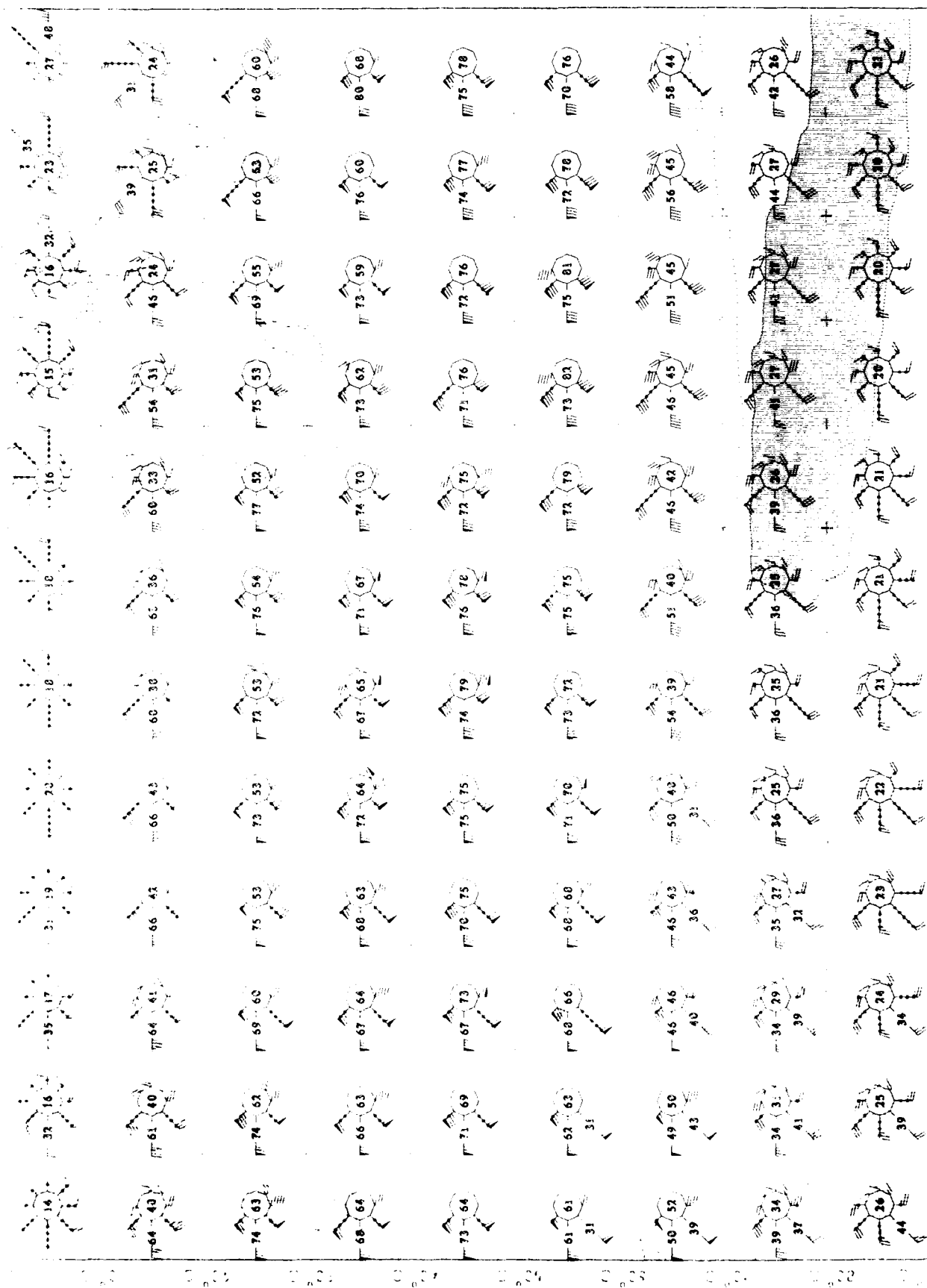
Handwritten notes and signatures on the right margin, including the name "J. J. J." and other illegible text.





100 99 98 97 96 95 94 93 92 91 90 89 88 87 86 85 84 83 82 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

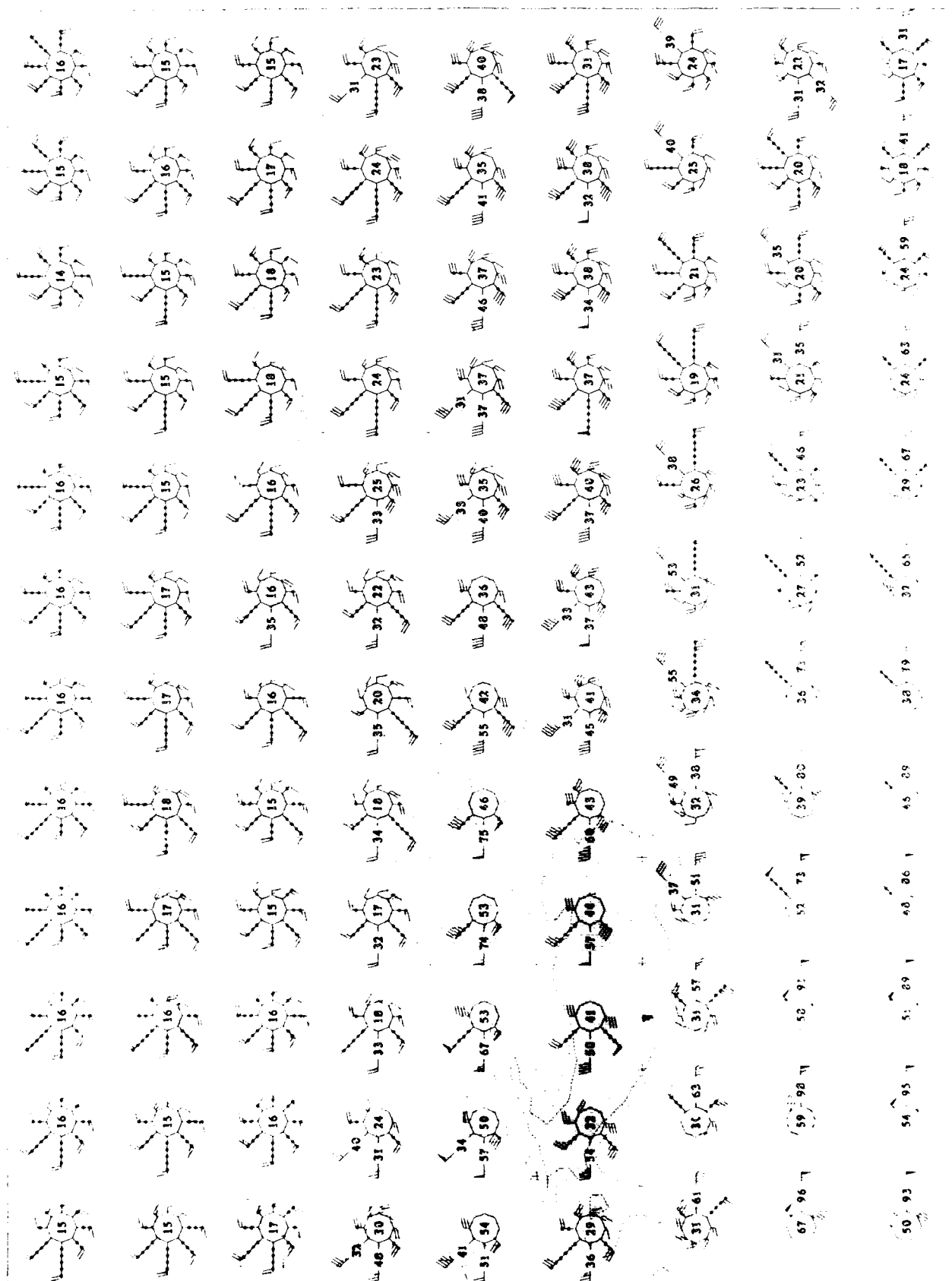


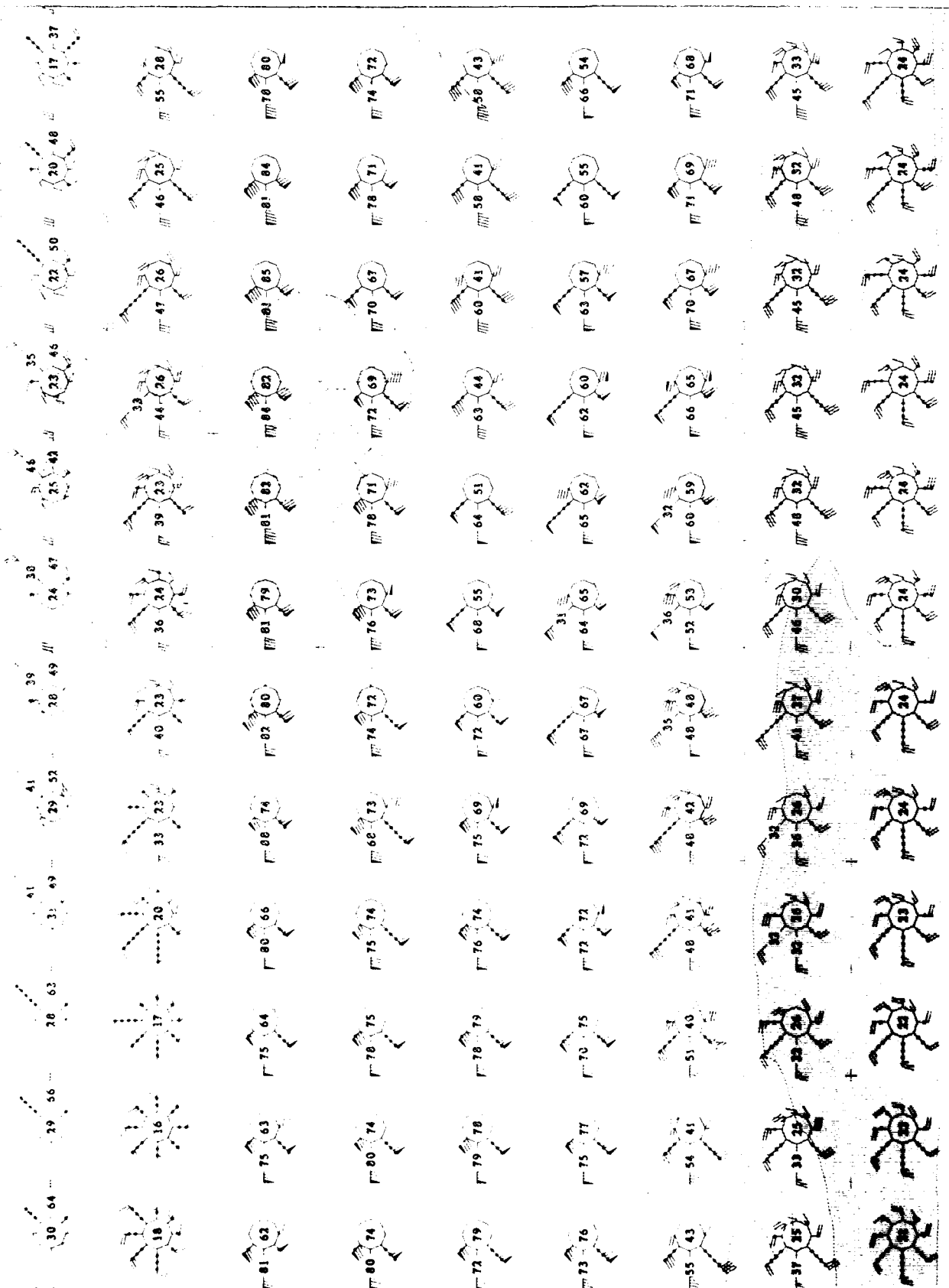


Upper Air Climatology
Northern Hemisphere

Chapter 10

July
1971

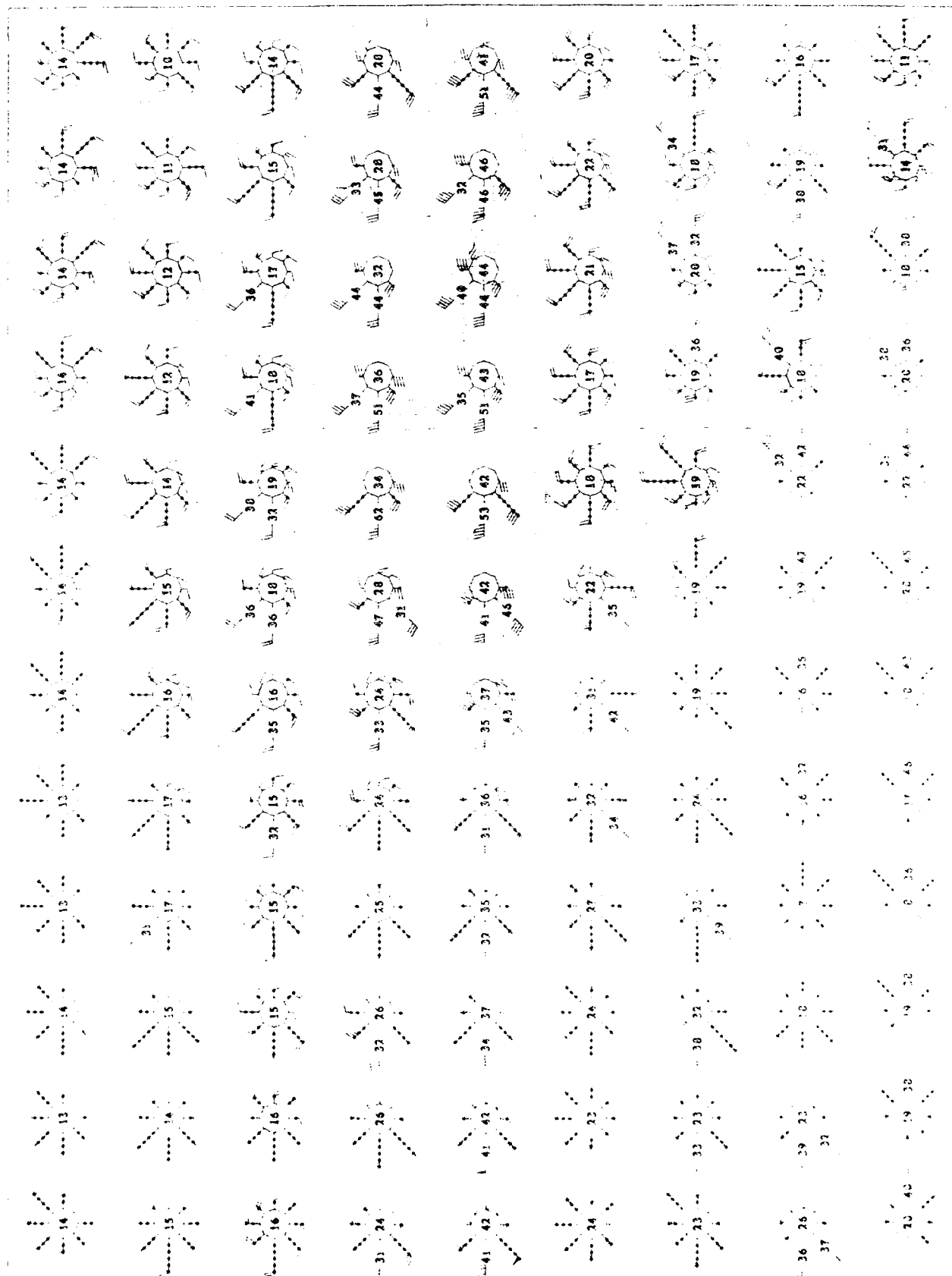


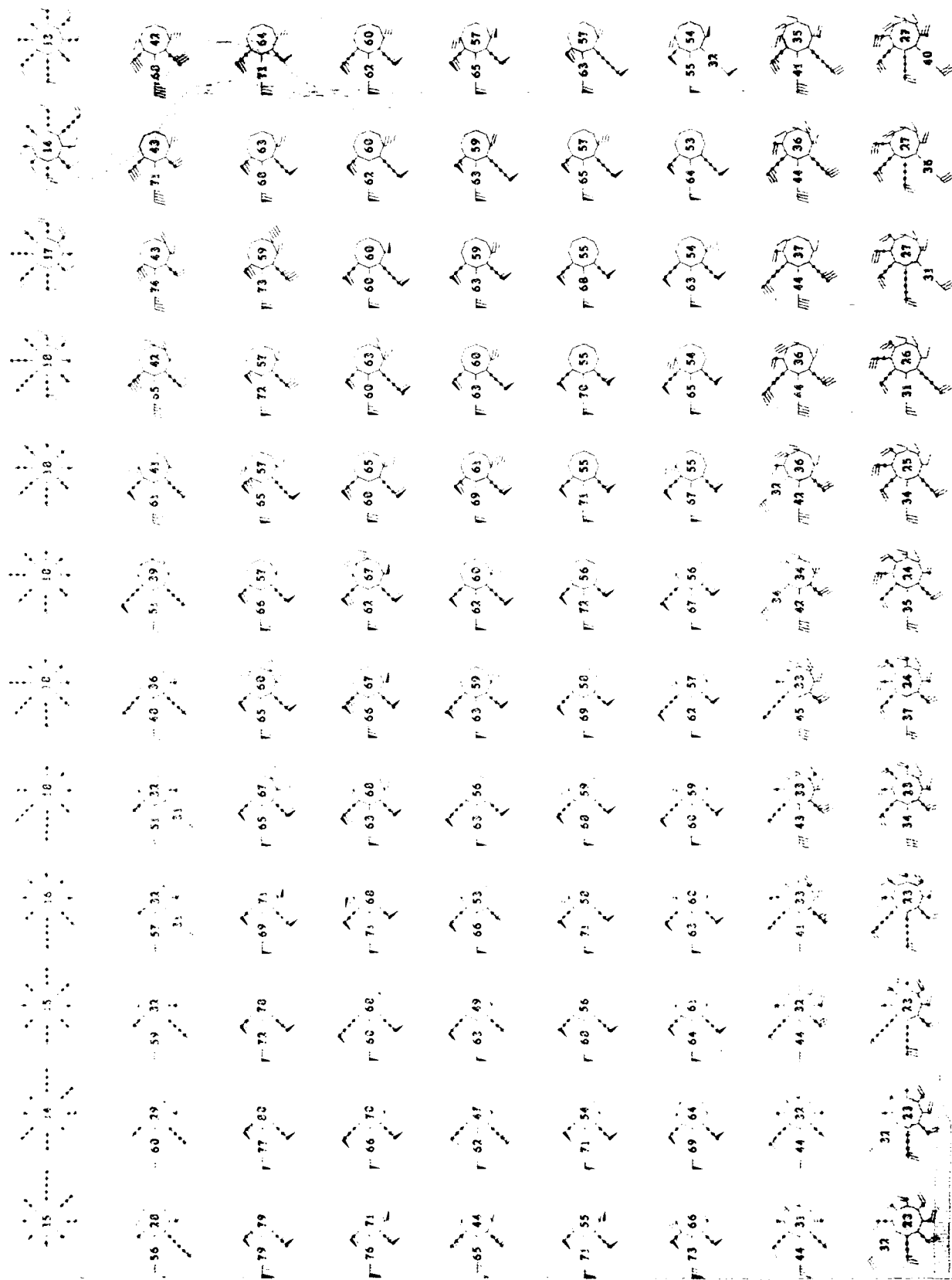


Upper Air Chemistry
 Southern Hemisphere

1977-1978
 1979-1980

July
 1980 M/C



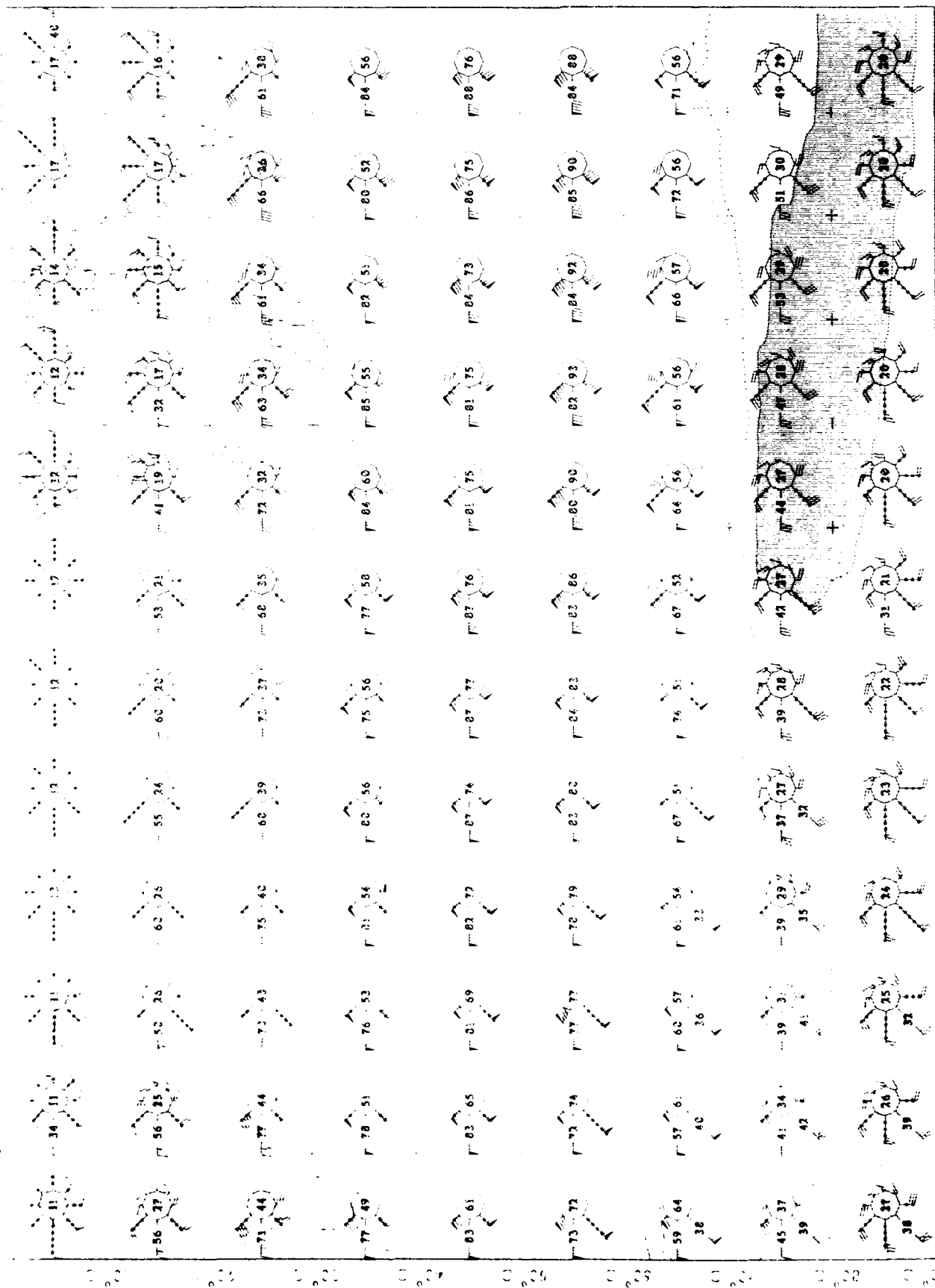


Upper Limb Kinematics
Controlled Environment

Controlled Environment
Controlled Environment

Controlled Environment
Controlled Environment



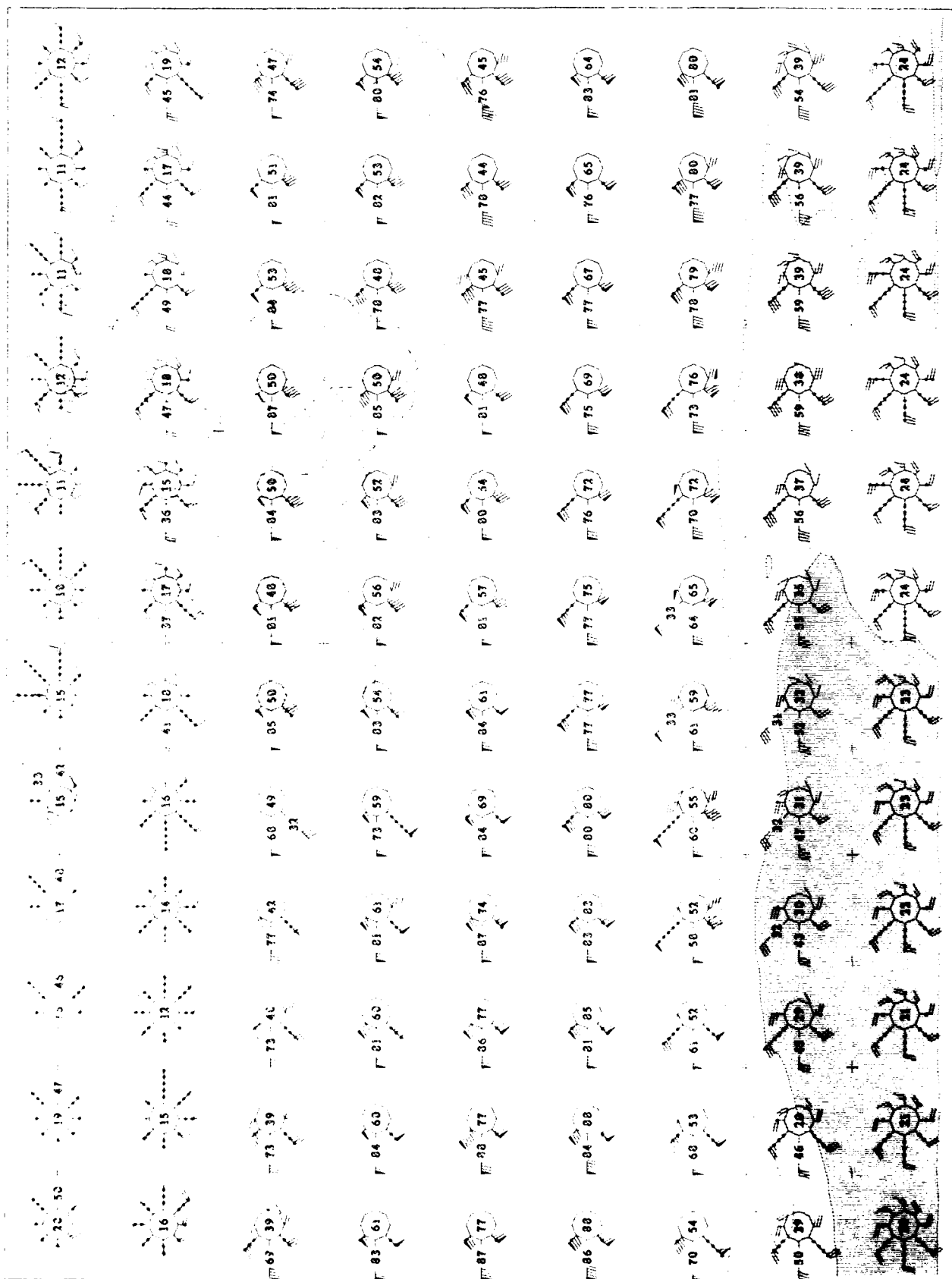


Upper Air Climatology
Southern Hemisphere

1950-1959

1960-1969

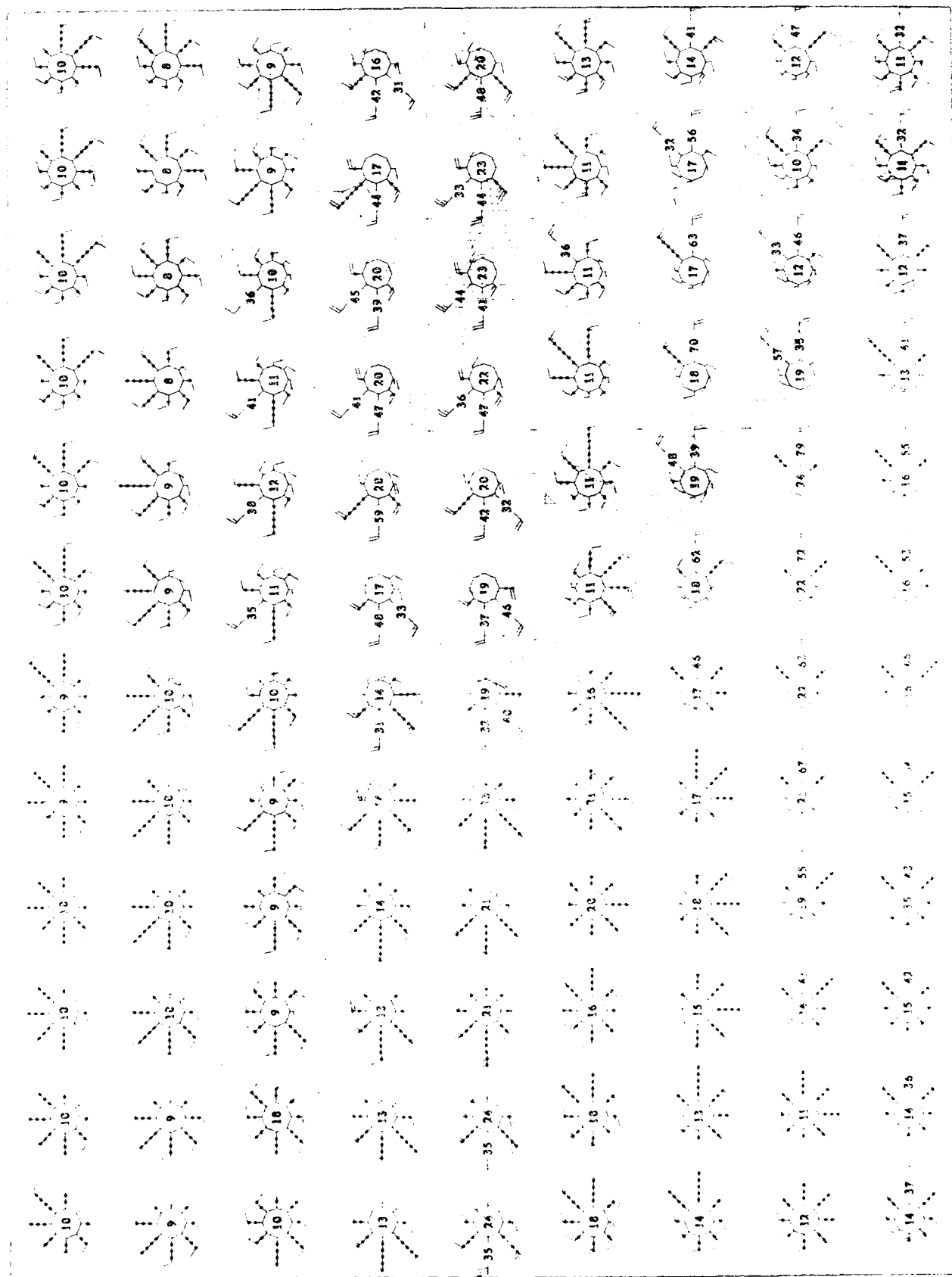


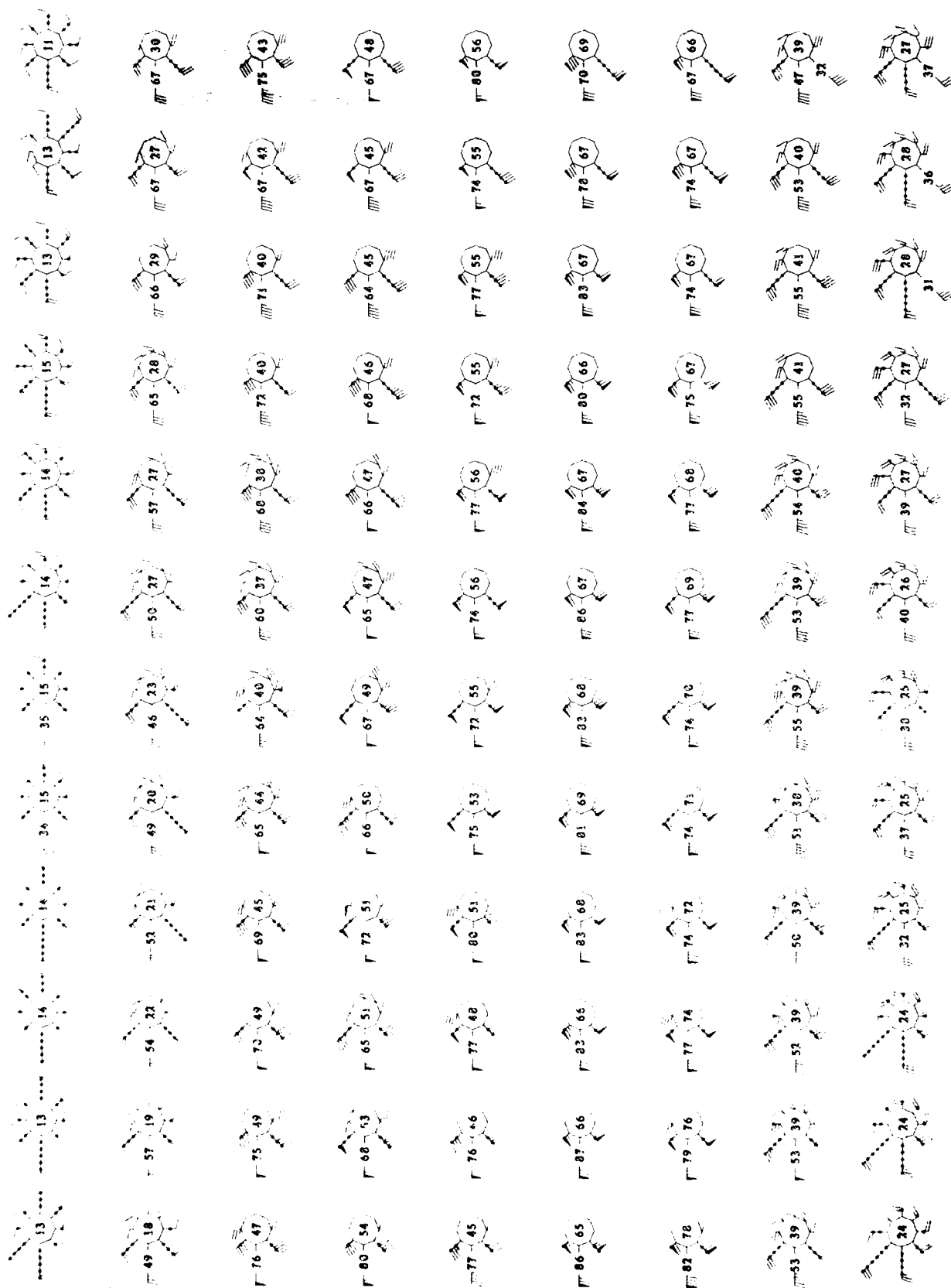


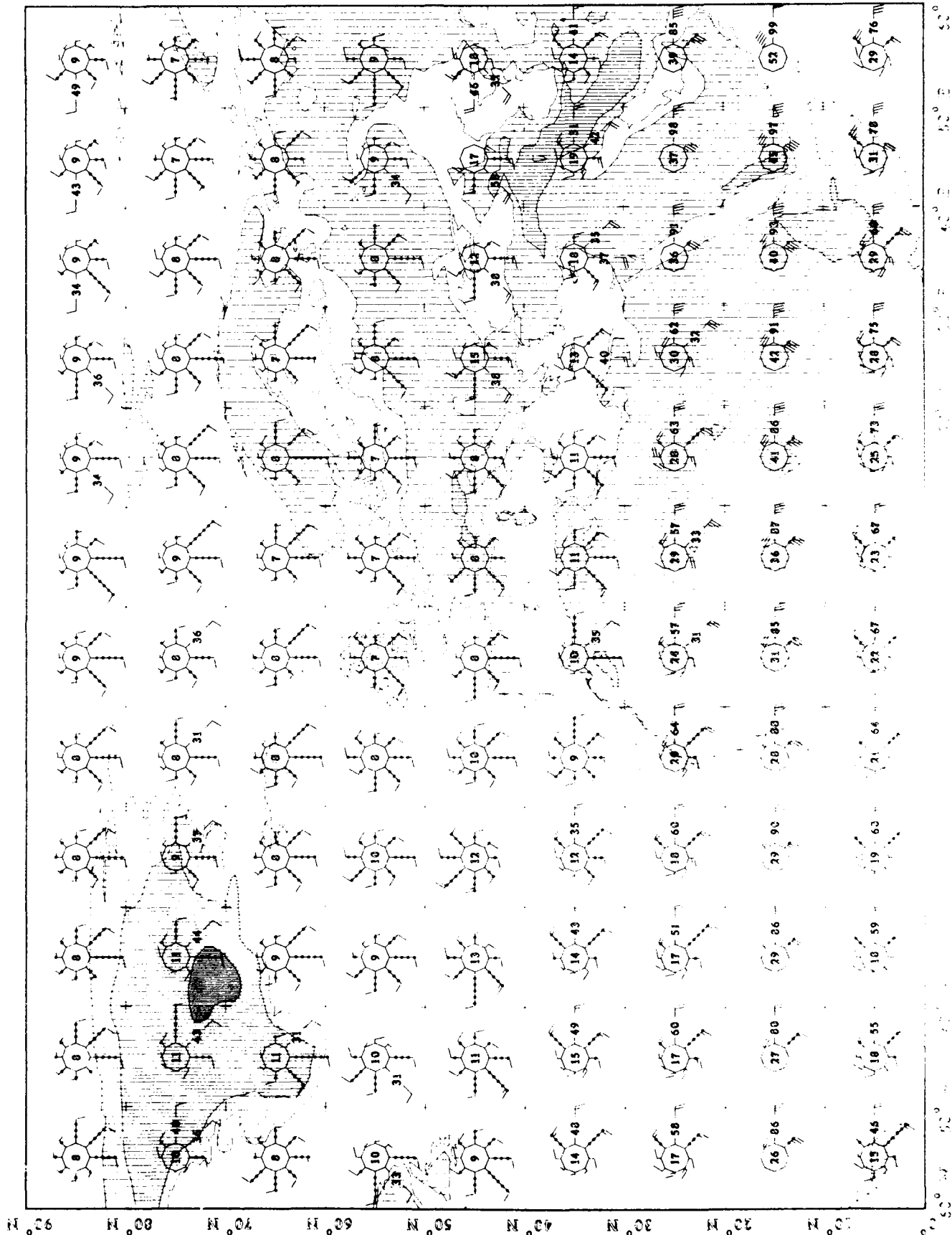
Upper Air Chiroptology
 Carbonium Hemisphere

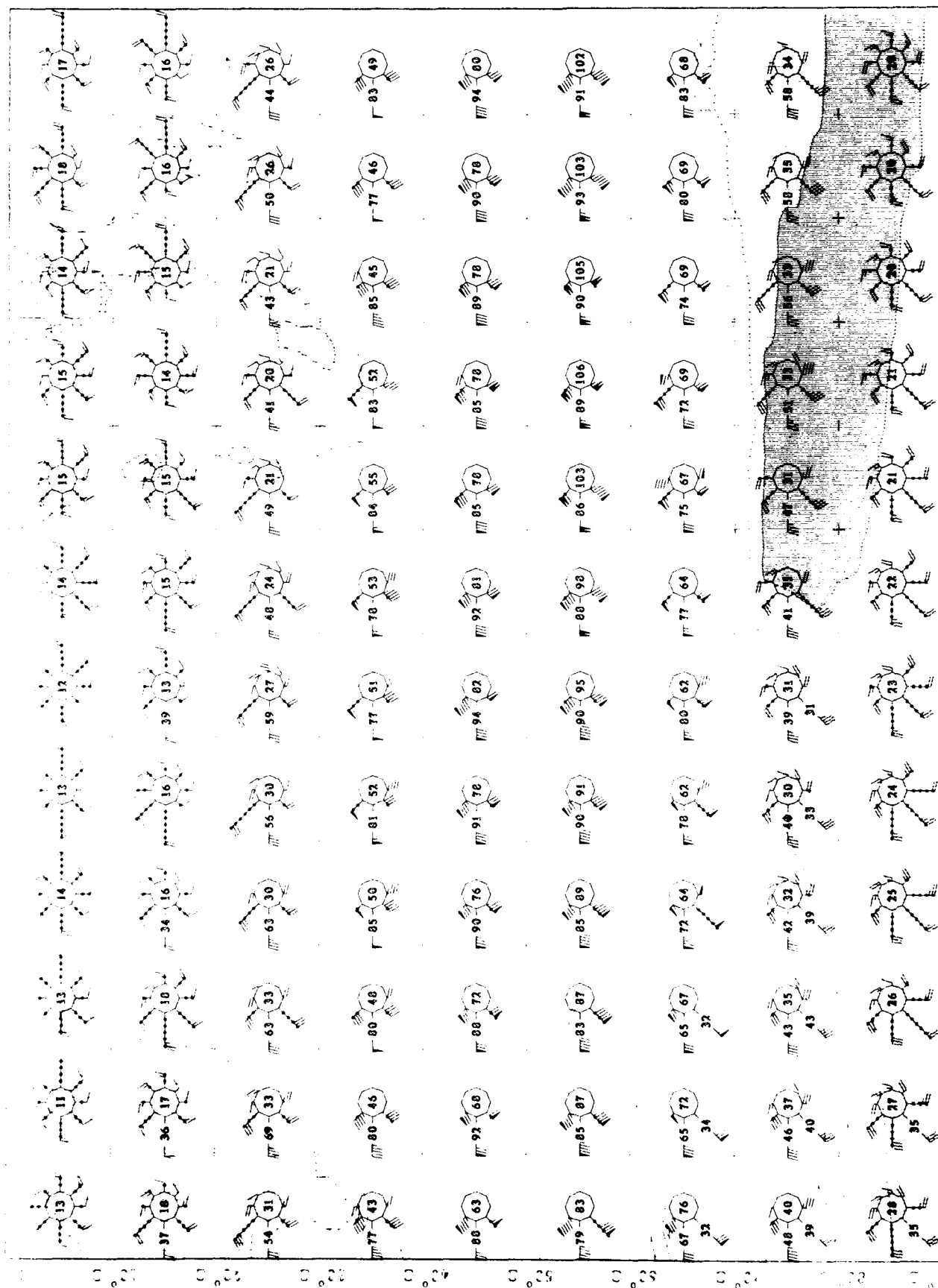
2007
 2007

2007
 2007







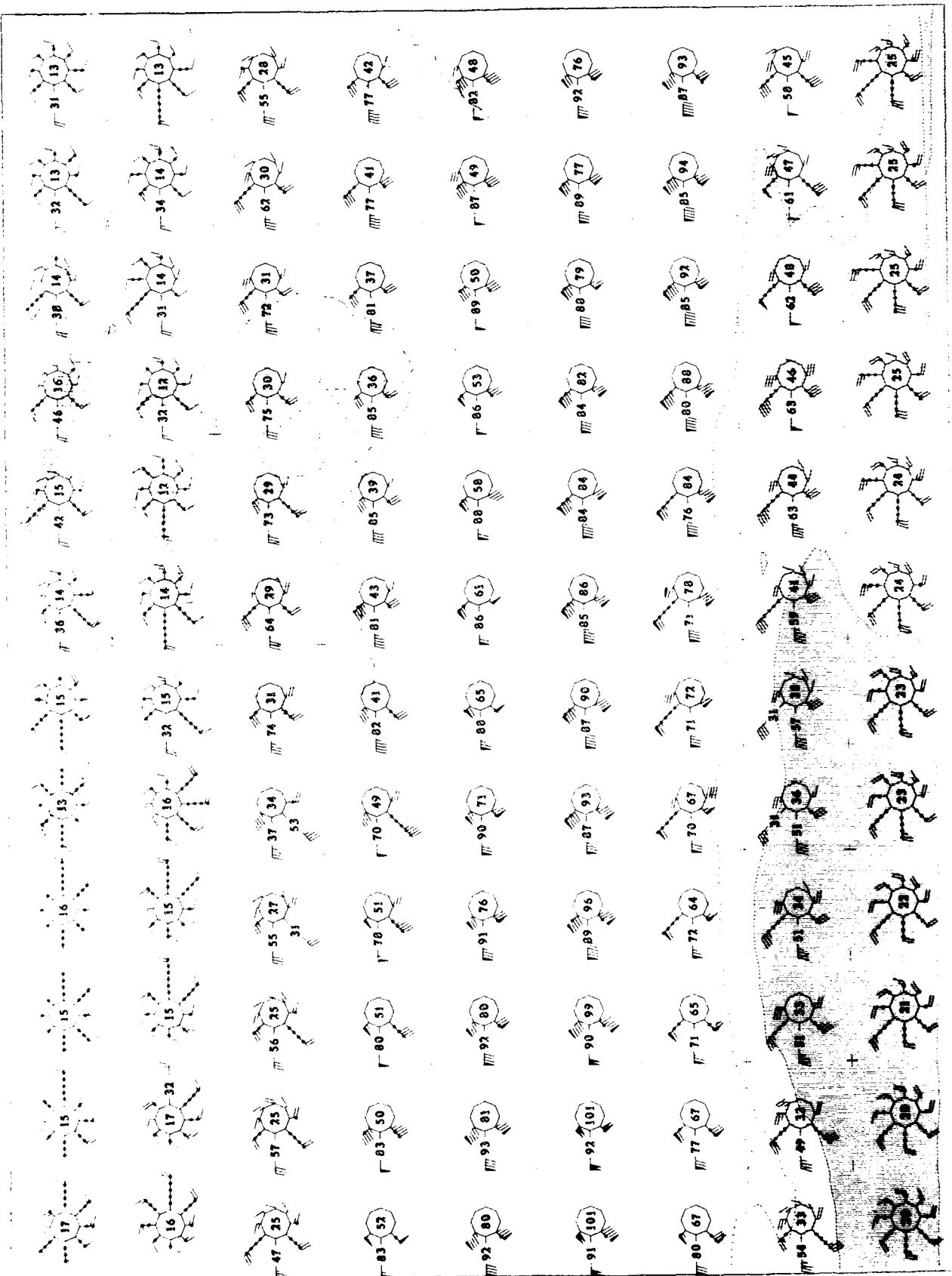


Upper Air Climatology
Southern Hemisphere

100
100

100
100

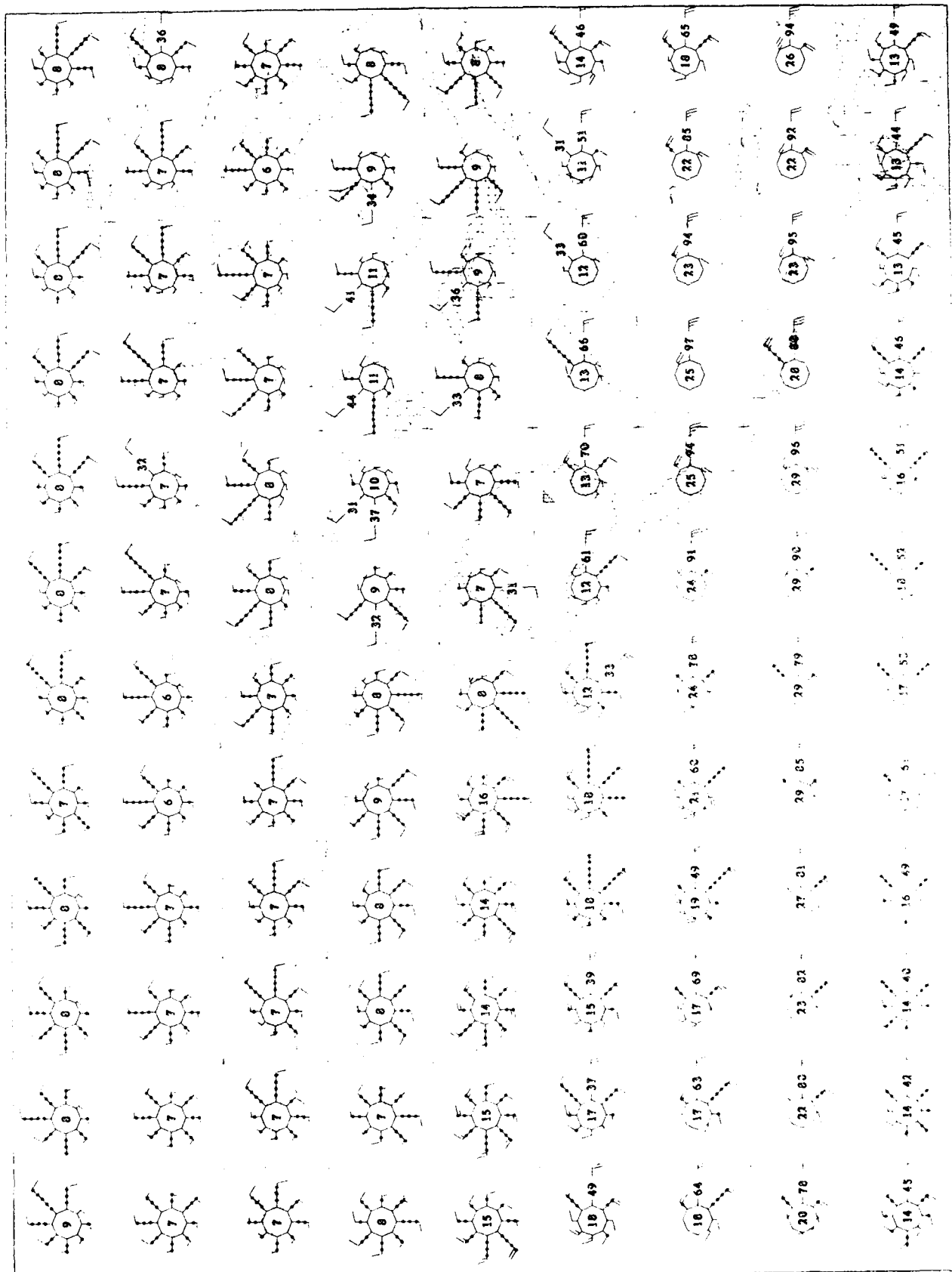


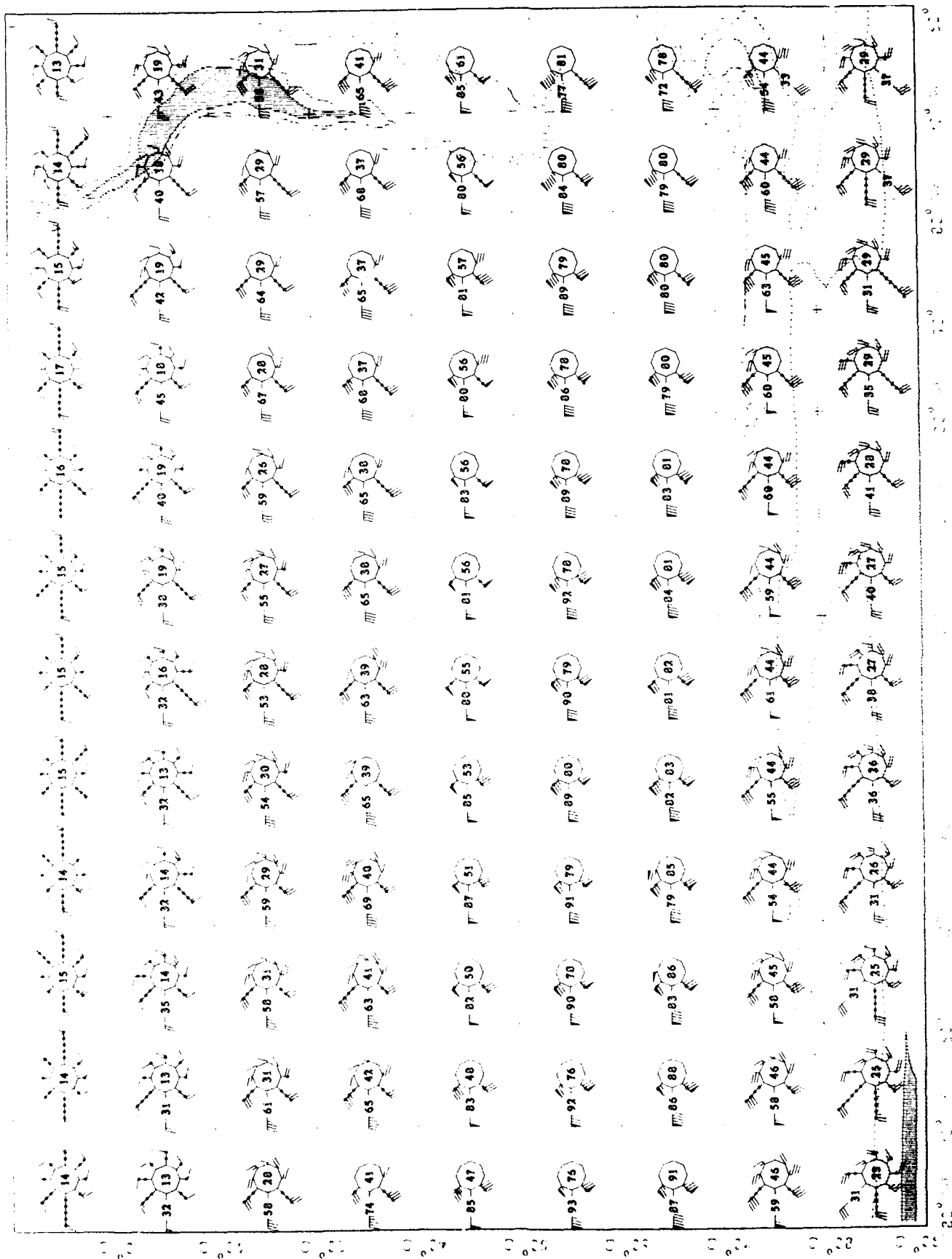


Upper Air Climatology
Southern Hemisphere

July 1970
70 M.2

July
70 M.2





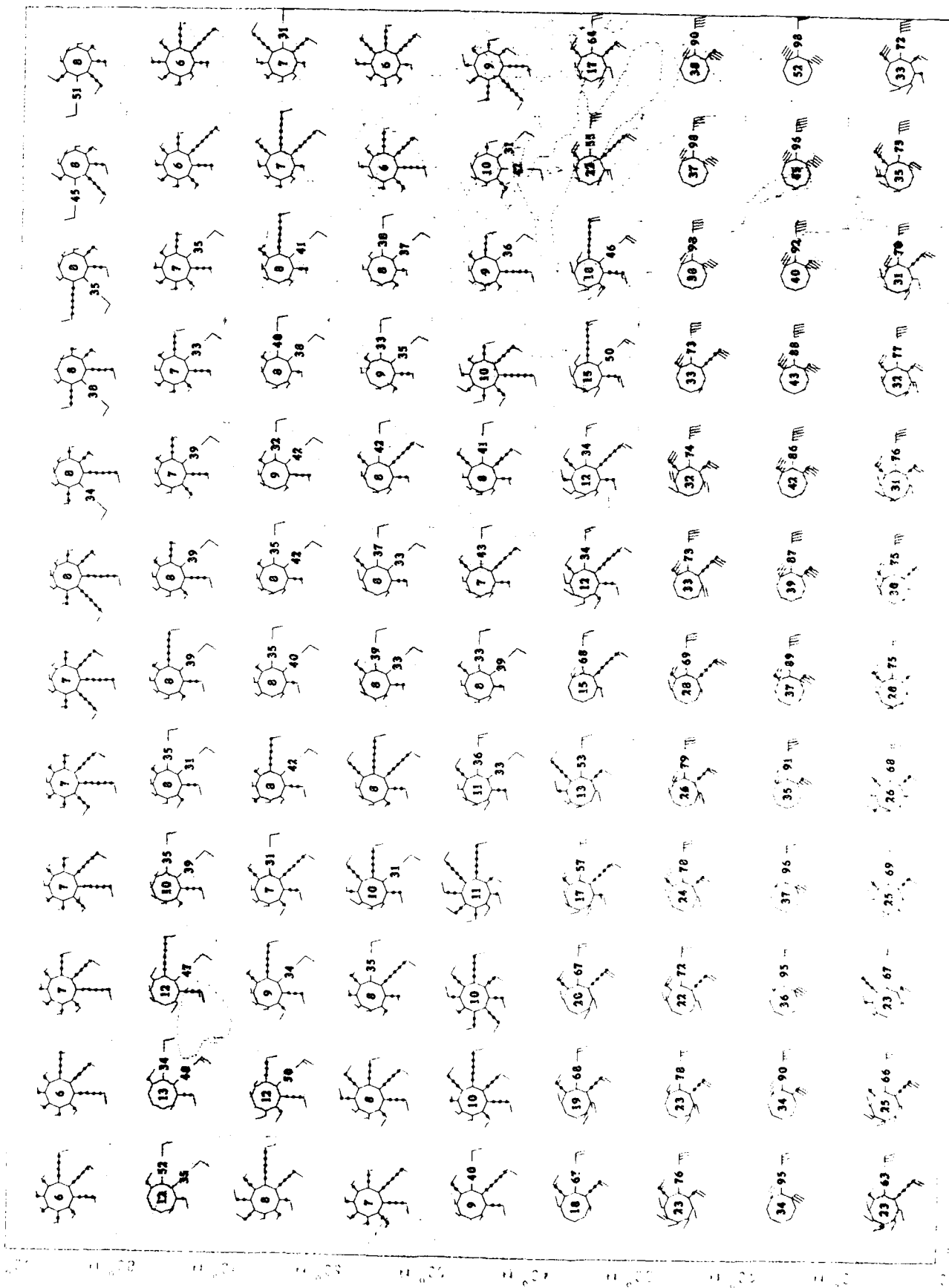
Upper Air Climatology
Southern Hemisphere

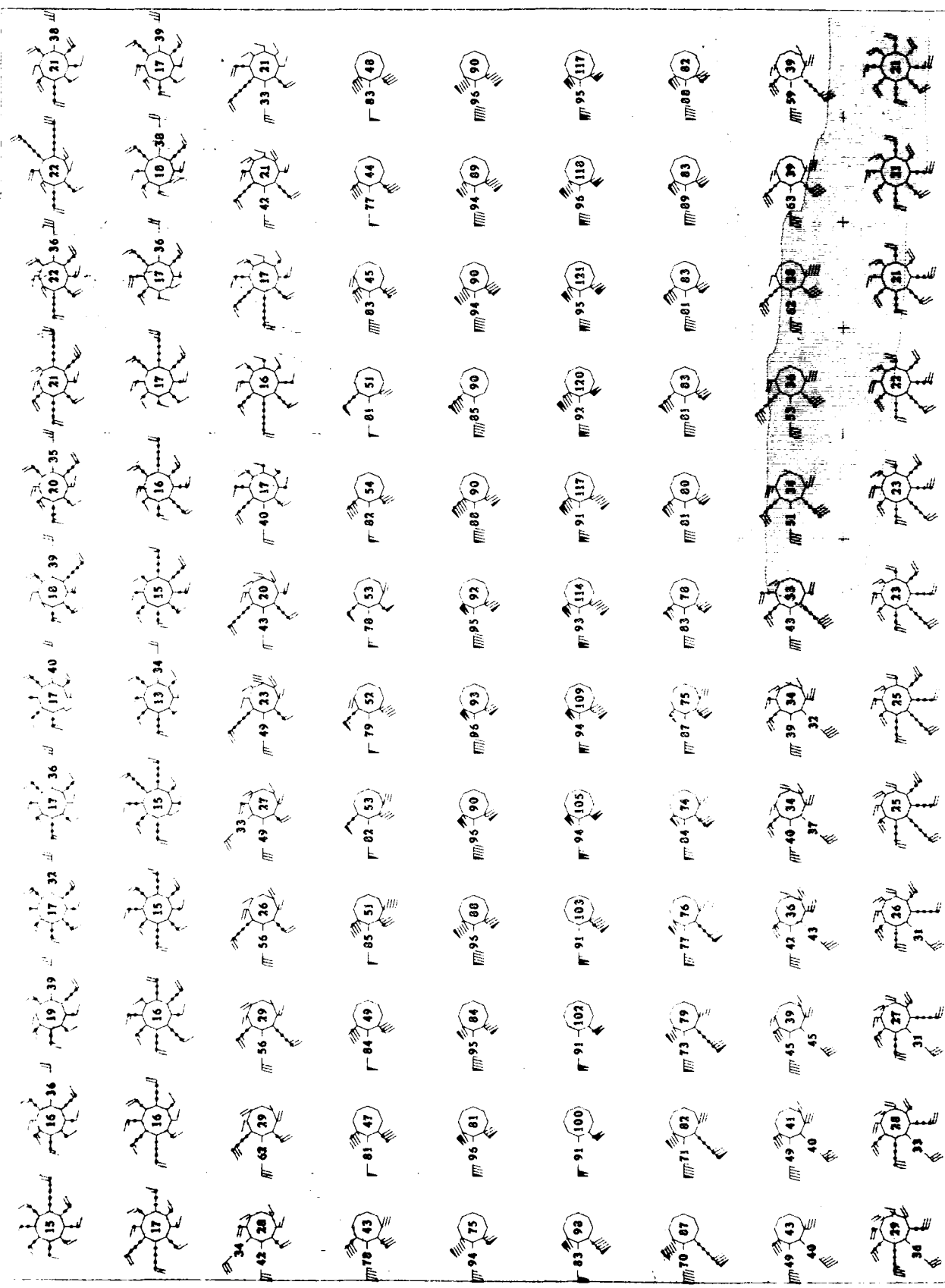
July
70 1415

Upper Air Climatology Northern Hemisphere

500 mb
Wind Roses

500 mb
SC MD





Upper Air Climatology
Southern Hemisphere

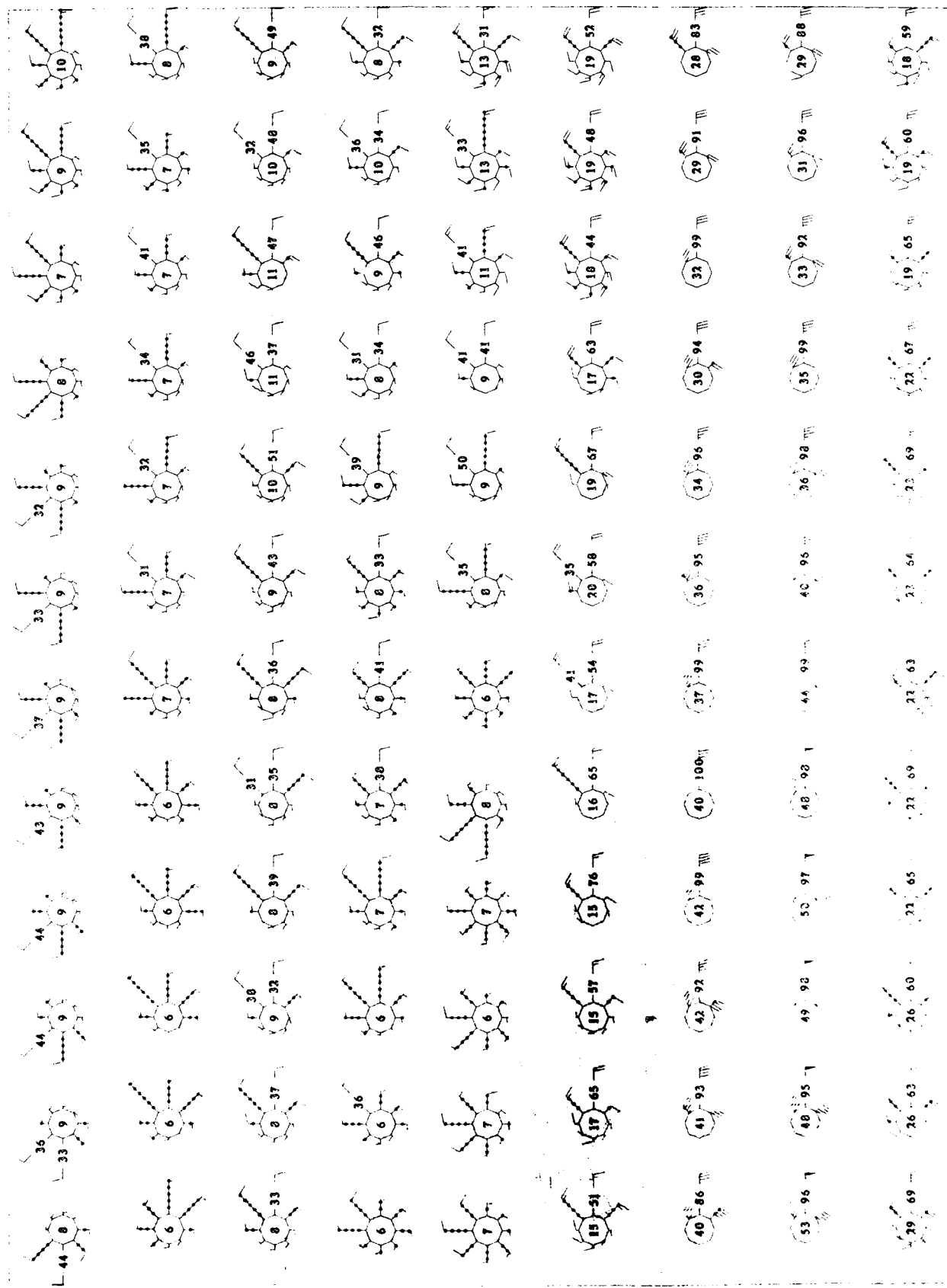
July 50 mb

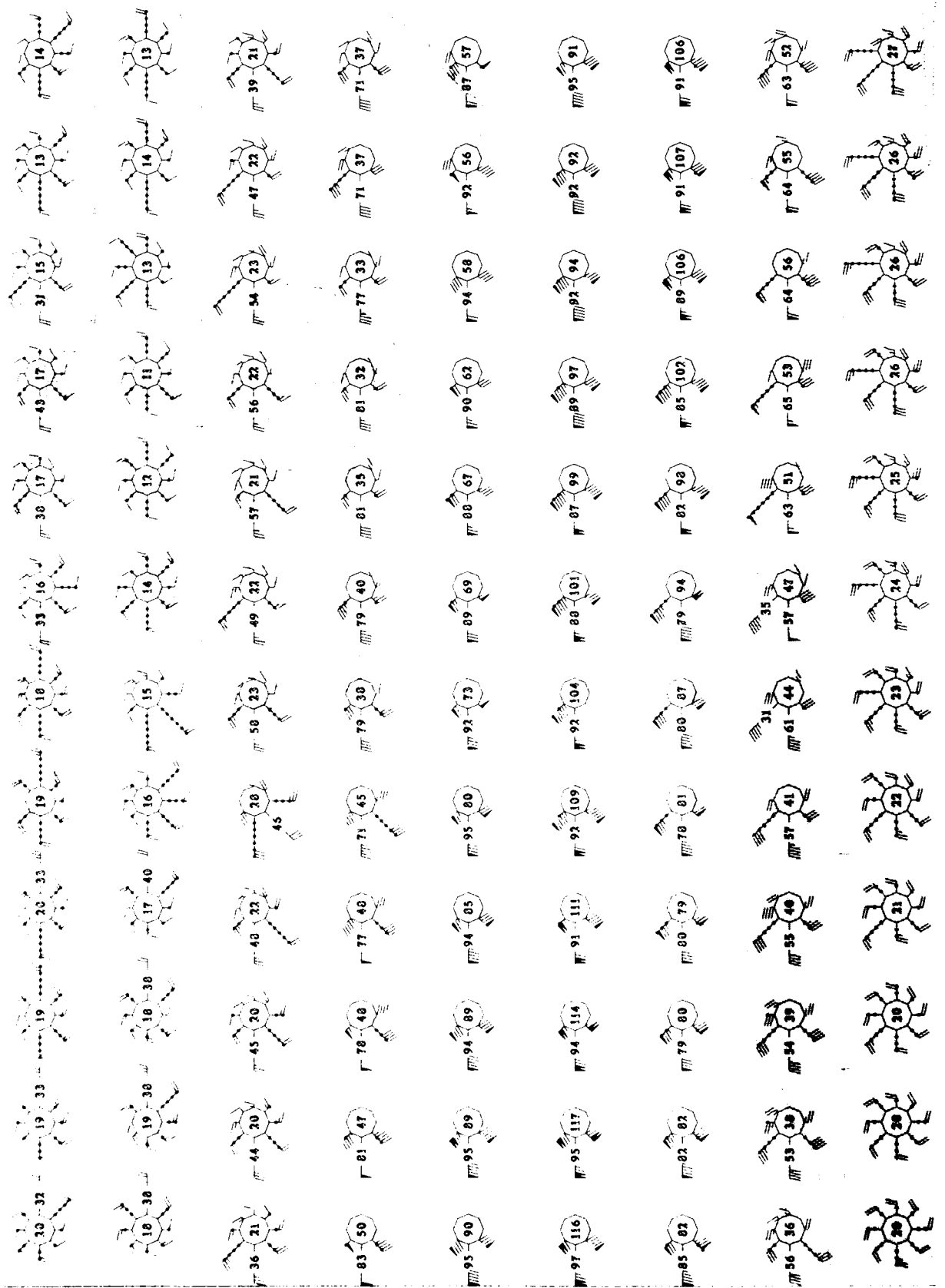
July 50 mb

Upper Air Climatology Northern Hemisphere

500 mb - 200 mb
Wind Roses

July
50 mb

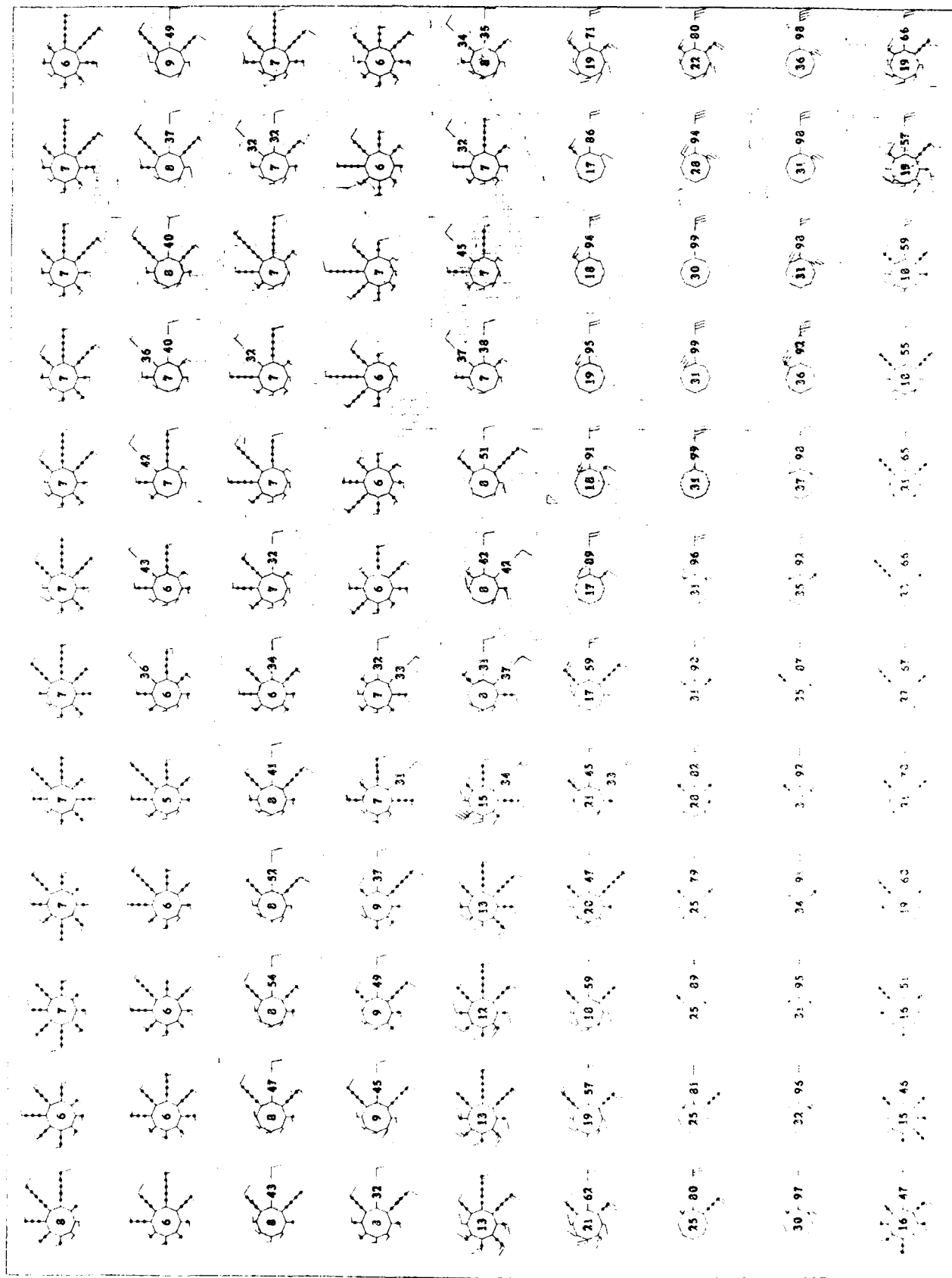


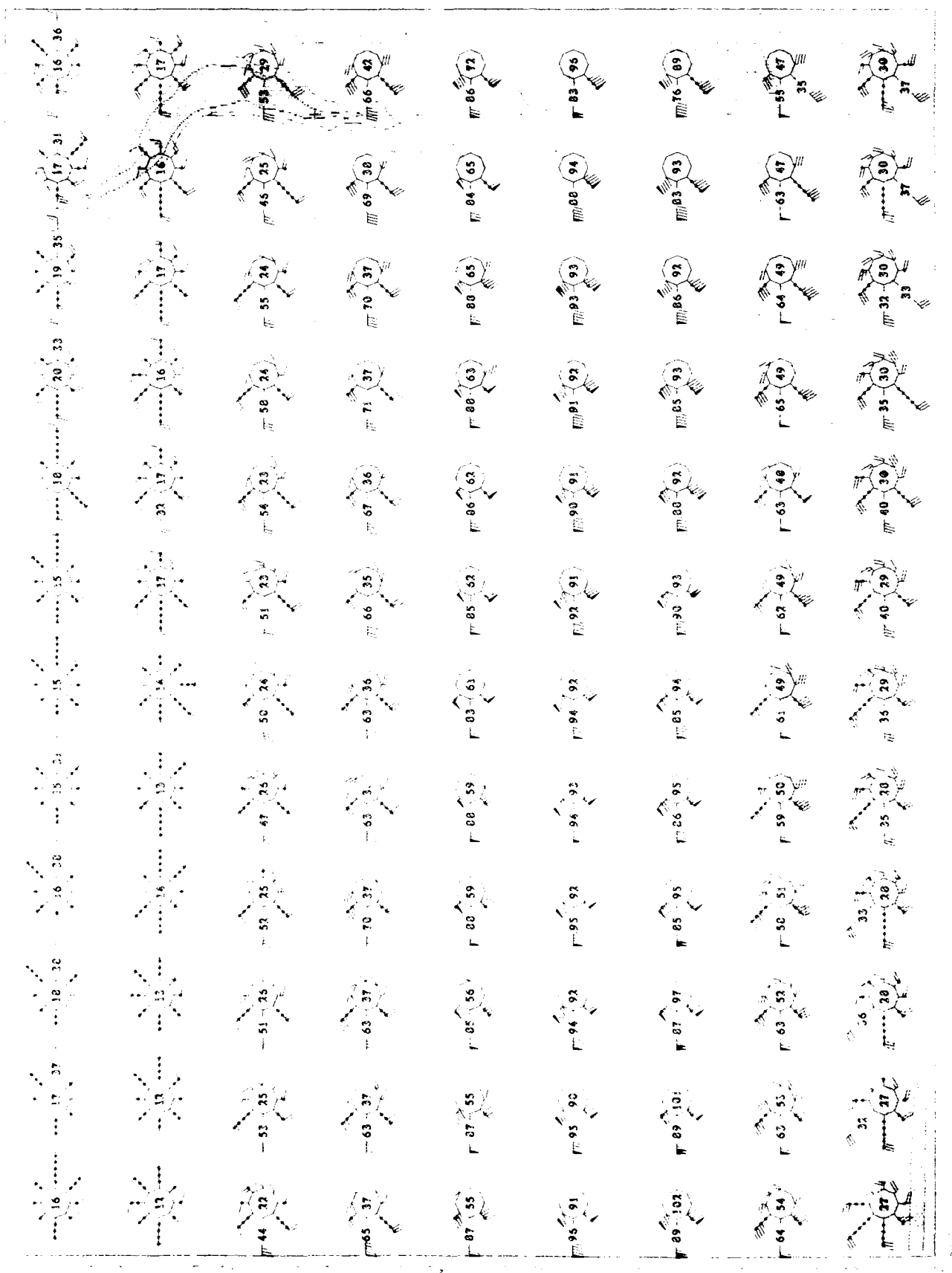


July
50 Miles

July 1950
White House

Upper Air Climatology
Northern Hemisphere

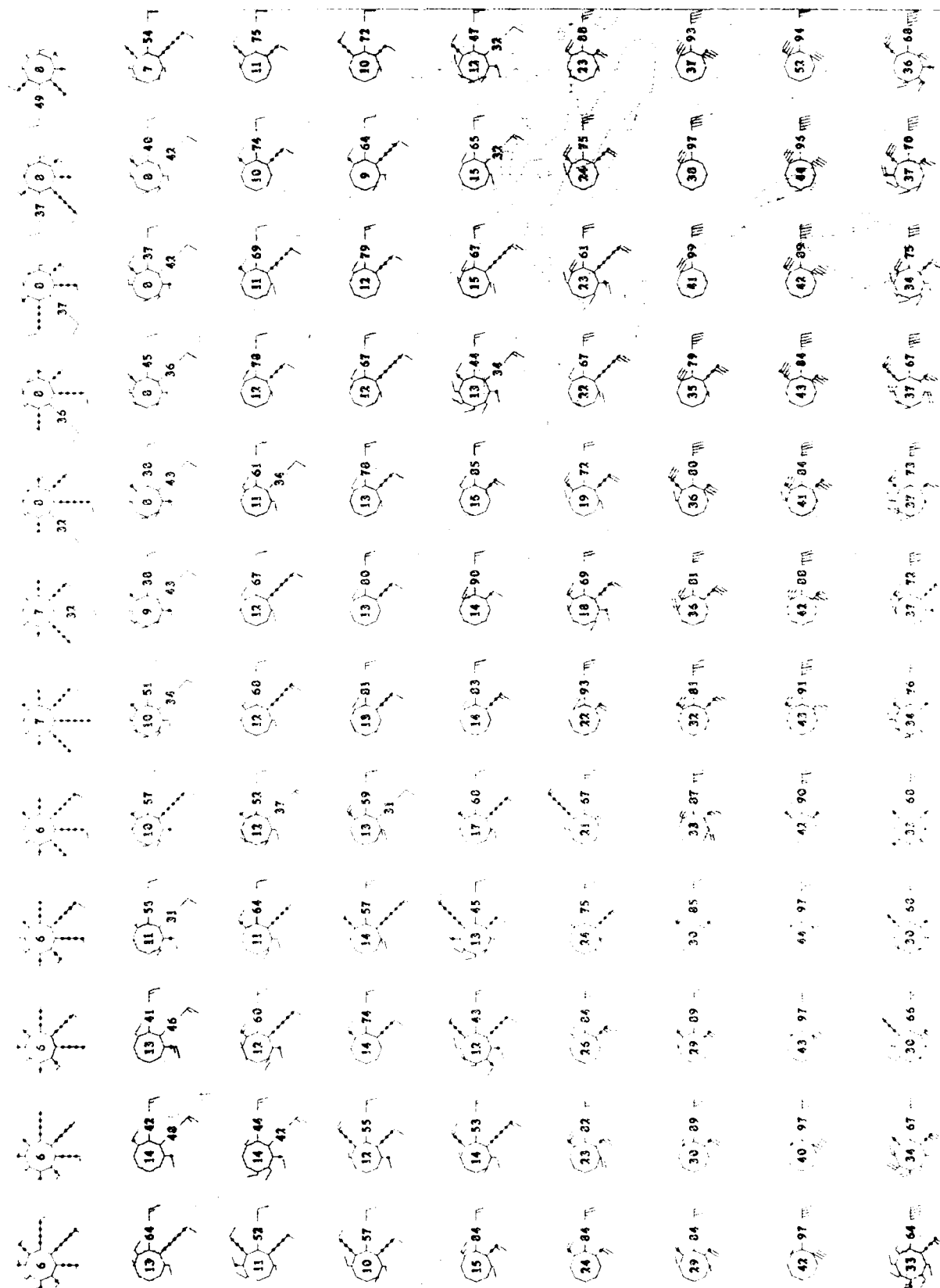


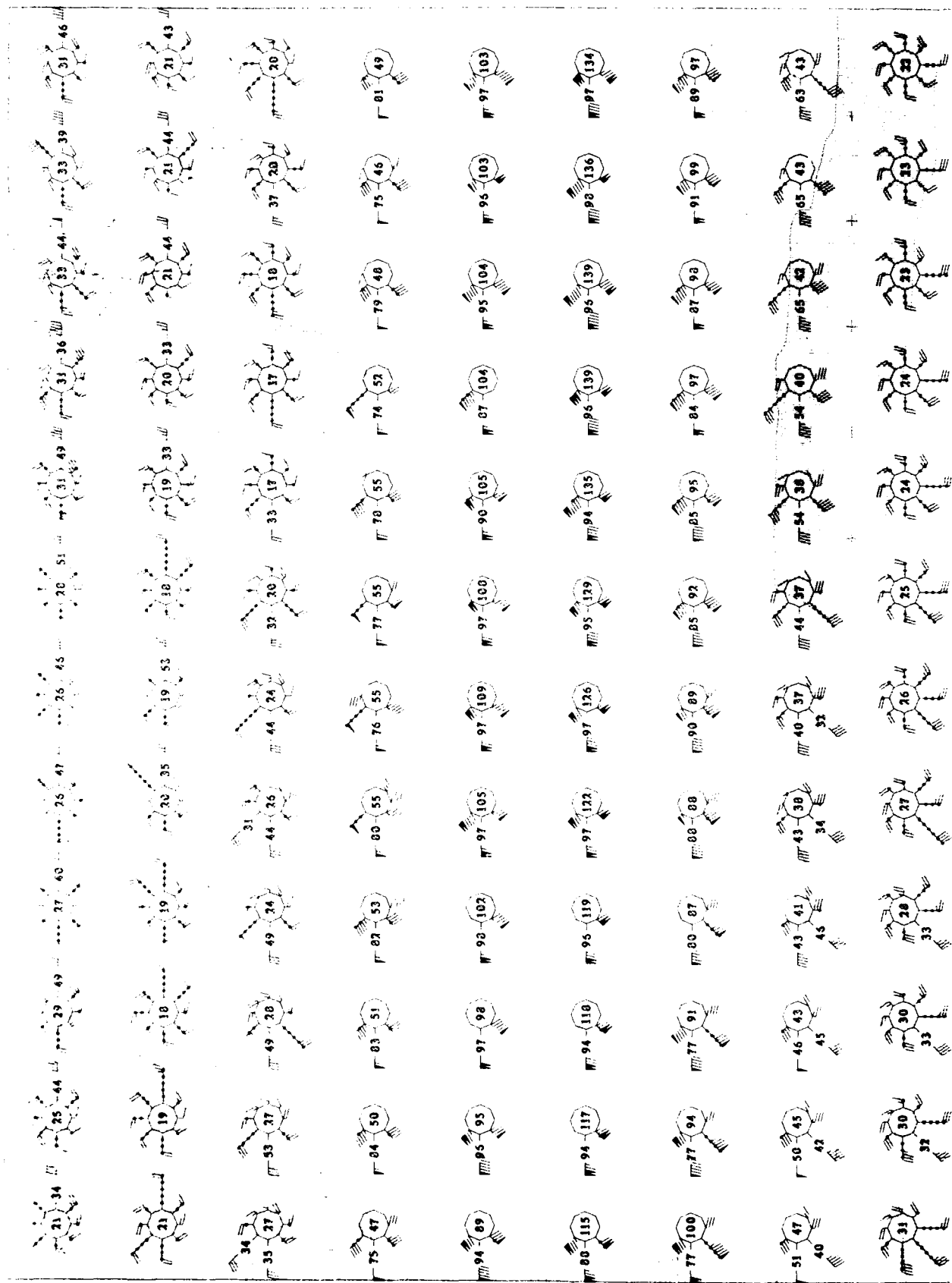


Upper Air Climatology
Southern Hemisphere

101

101

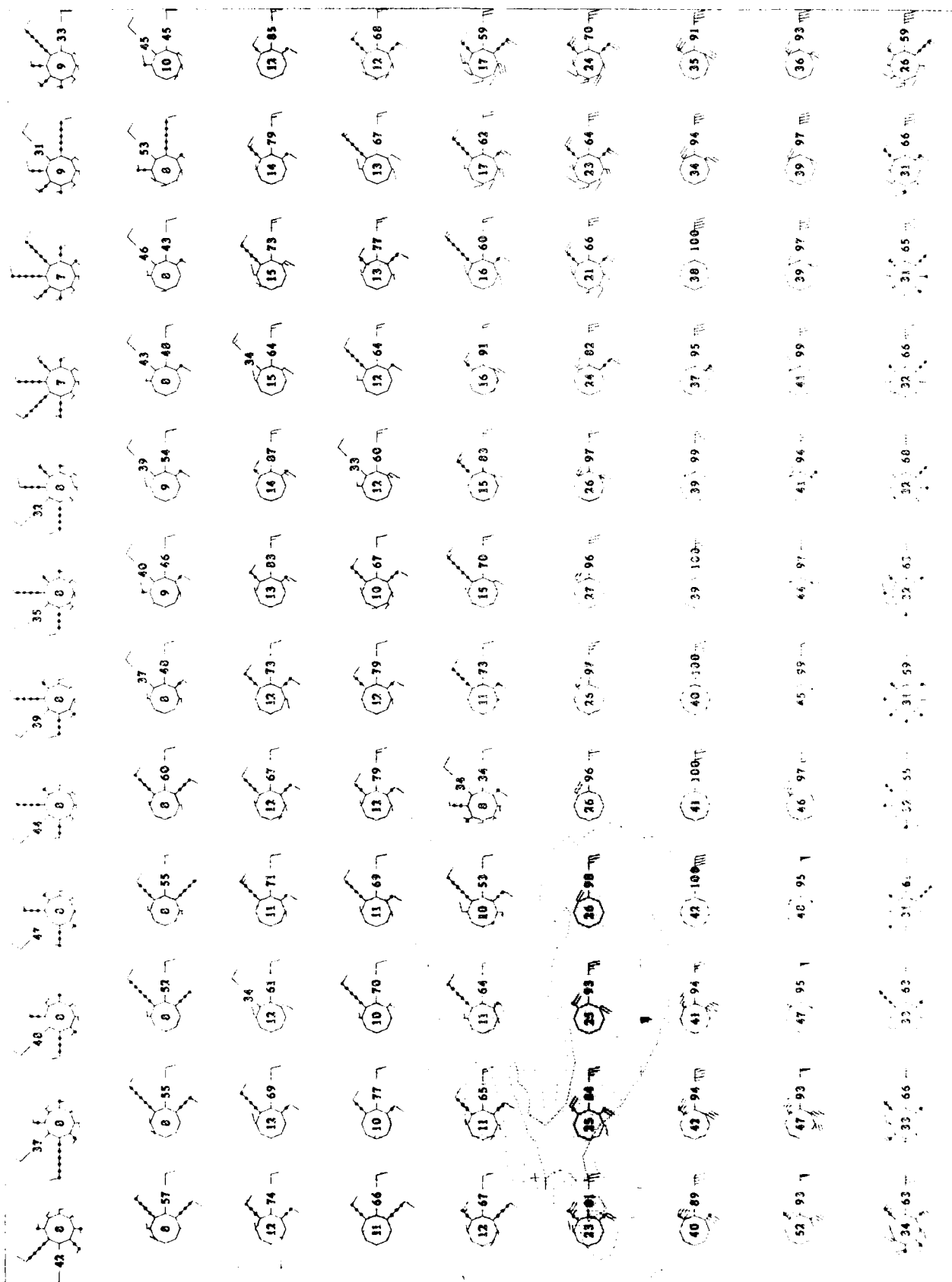


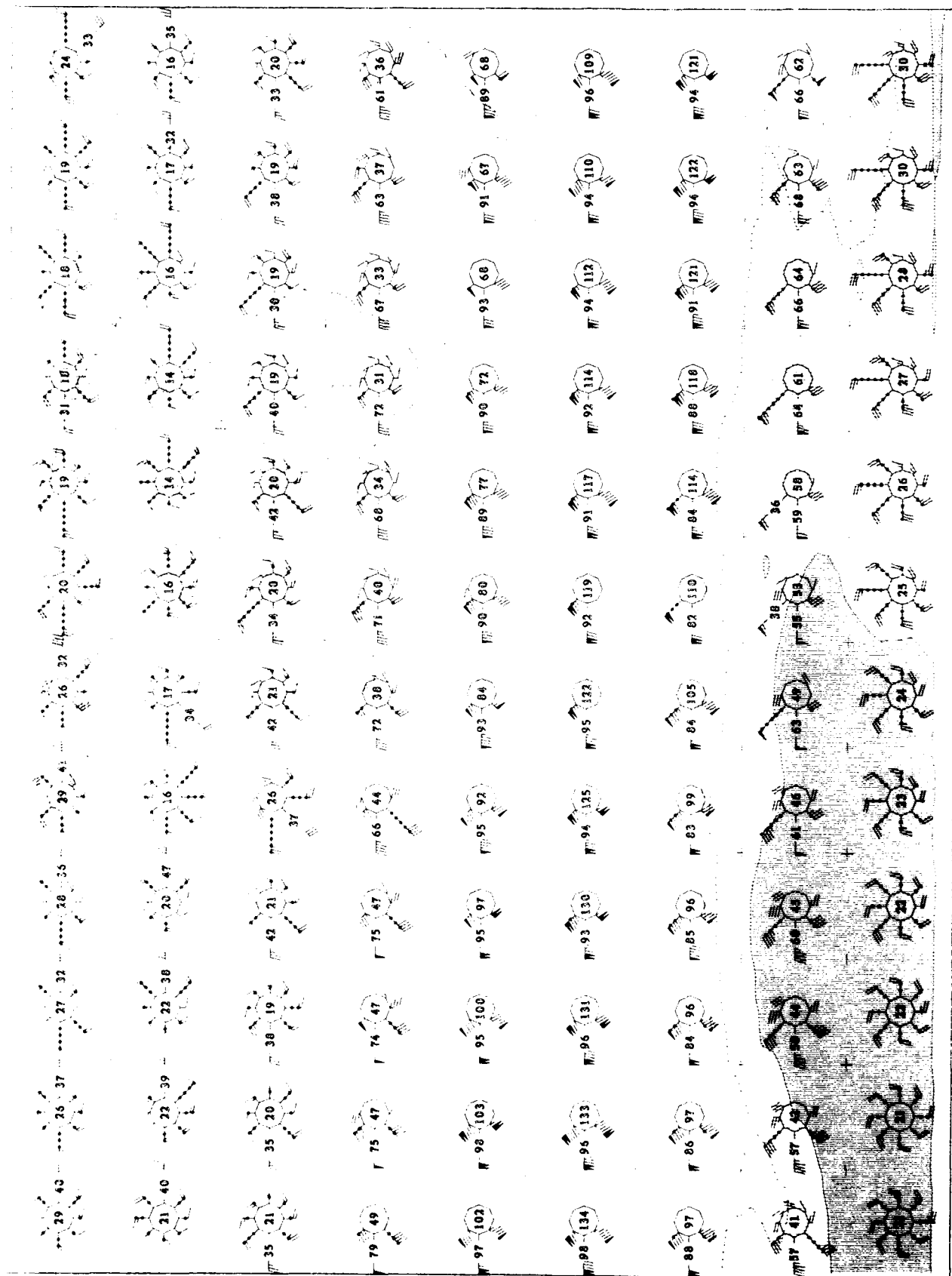


Upper Air Climatology
Southern Hemisphere

July 1950

30 ME





Upper Air Climatology
Southern Hemisphere

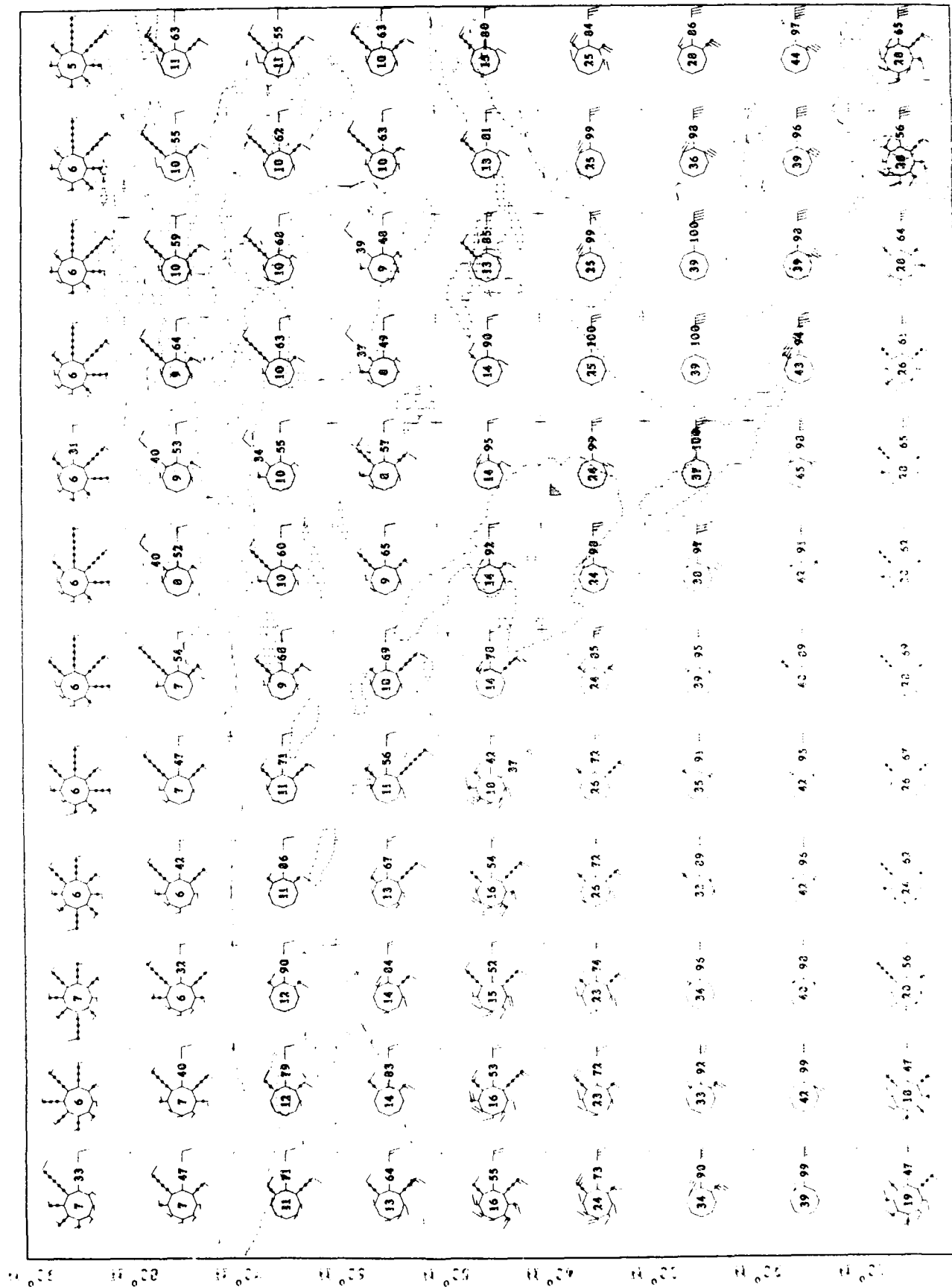
1950-1959

July
20 1950

July
31 AM's

July 31 AM's
Upper Air Climatology

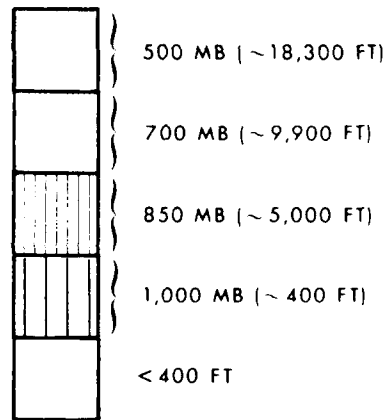
Upper Air Climatology
Northern Hemisphere



JET STREAM
(10 LEVELS, 500 TO 30 MB)

- Contours of mean scalar wind speed in knots
- Minimum mean scalar speed: 50 knots
- Contour interval of mean scalar speed: 25 knots

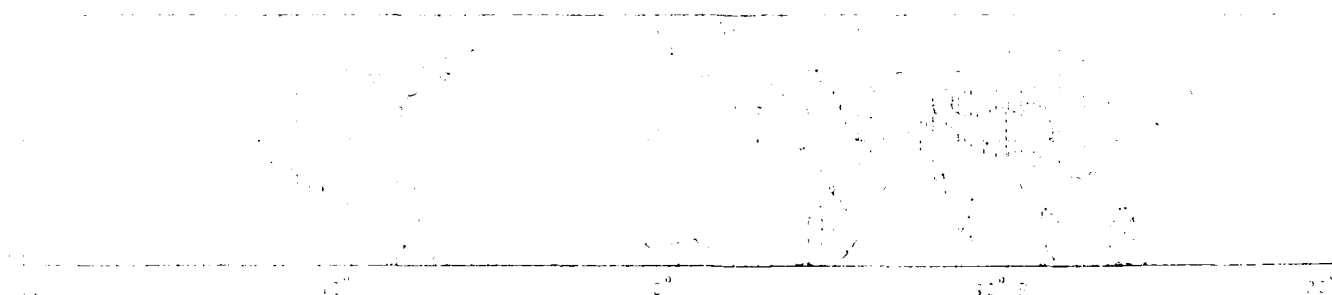
ELEVATION SCALE



10. Stream
0.1m + 0.5m
10y
0.1m

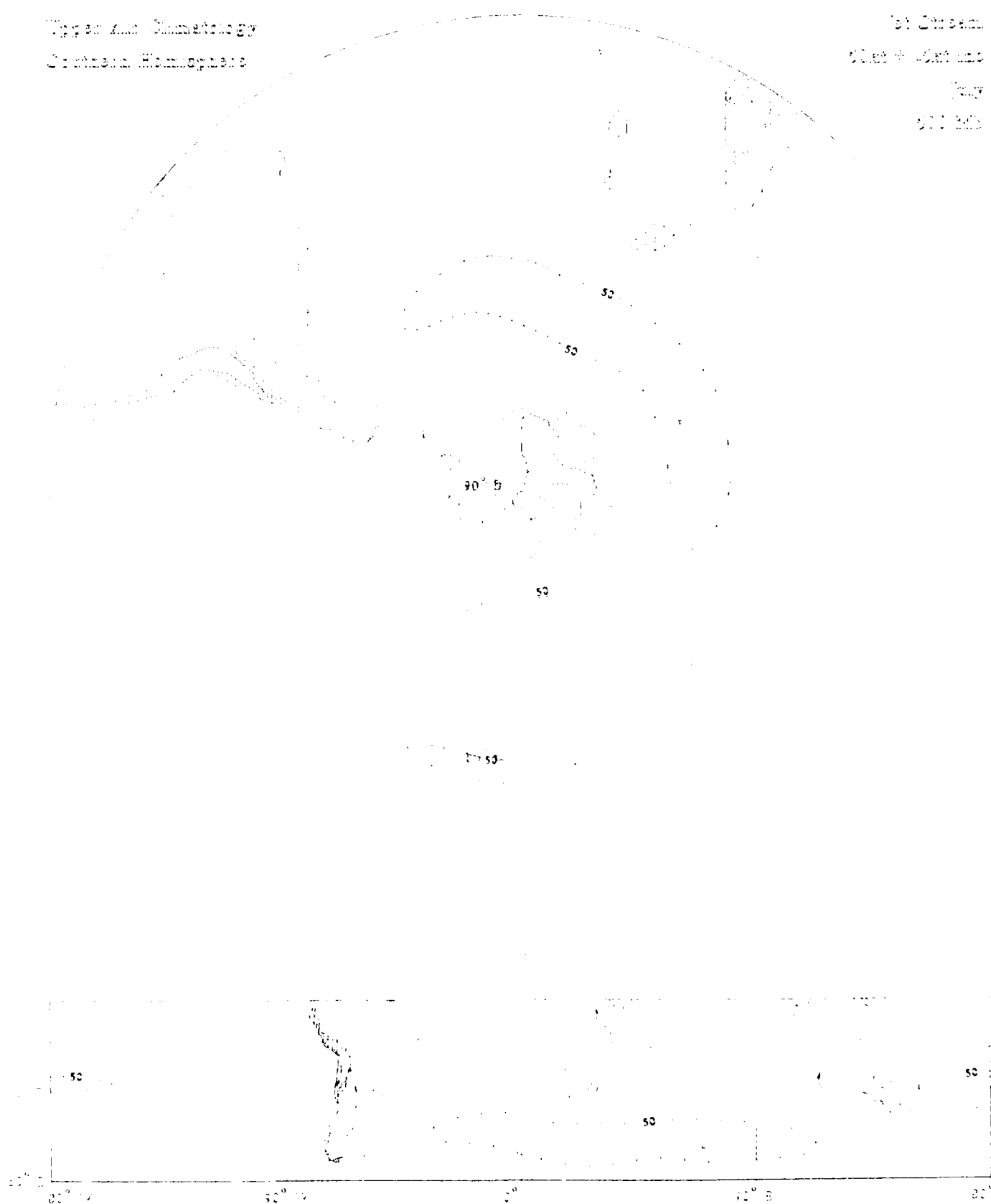
Upper Air Climatology
Northern Hemisphere

10Wm6 < 50 KT



Topographic Homogeneity
 Stream Homogeneity

1st Stream
 2nd Stream
 3rd Stream
 4th Stream



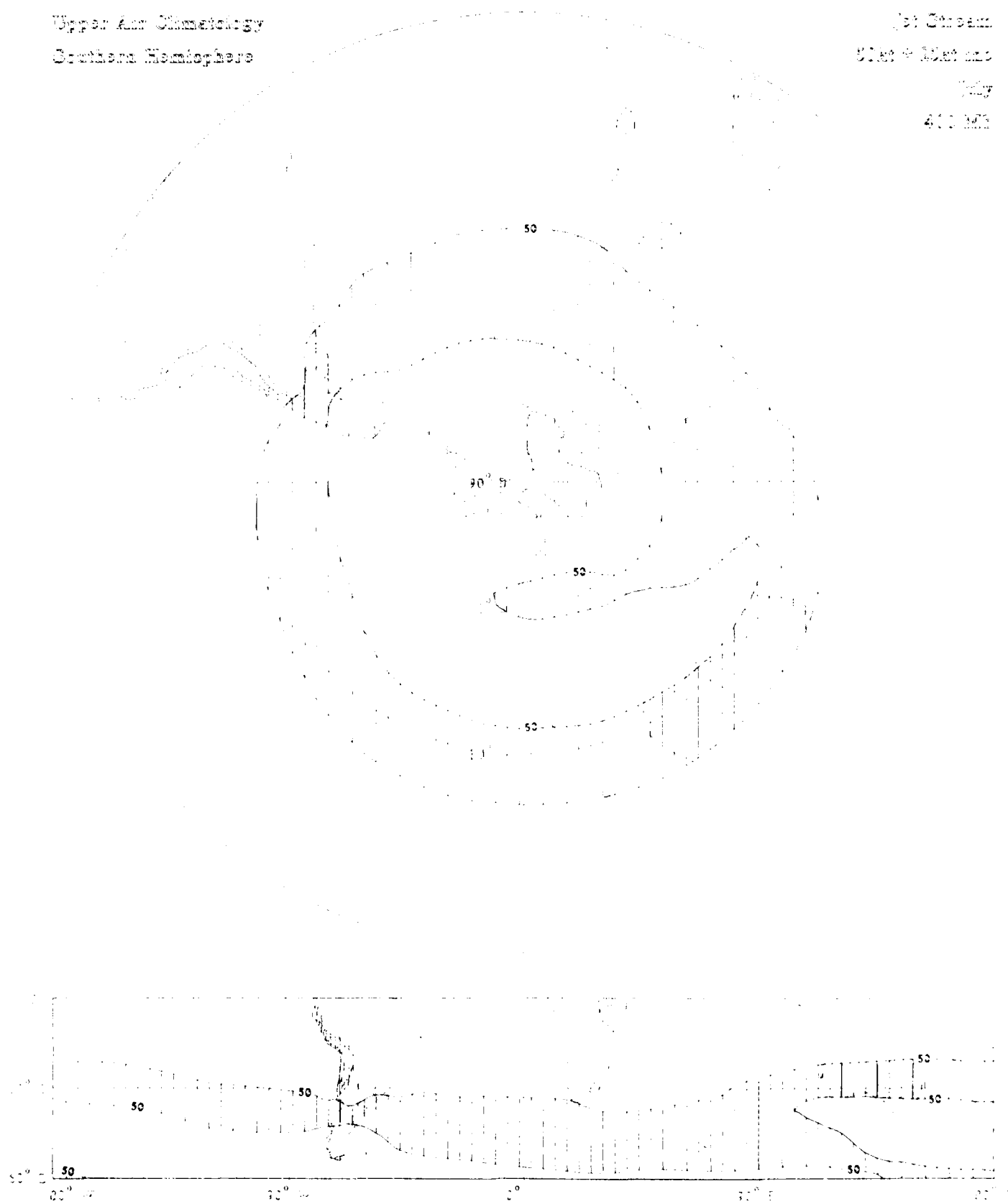
St. Stream
2000 + 2500 m
July
400 MB

Upper Air Climatology
Northern Hemisphere

Wind < 50 KT

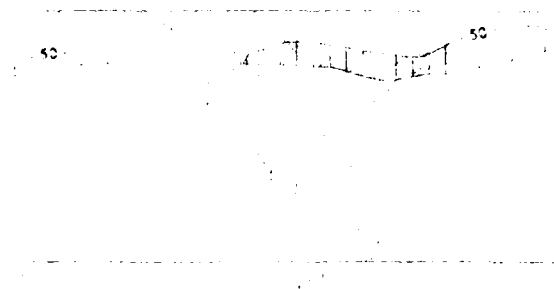
Upper Air Climatology
Southern Hemisphere

Jet Stream
500 hPa
July
400 mb



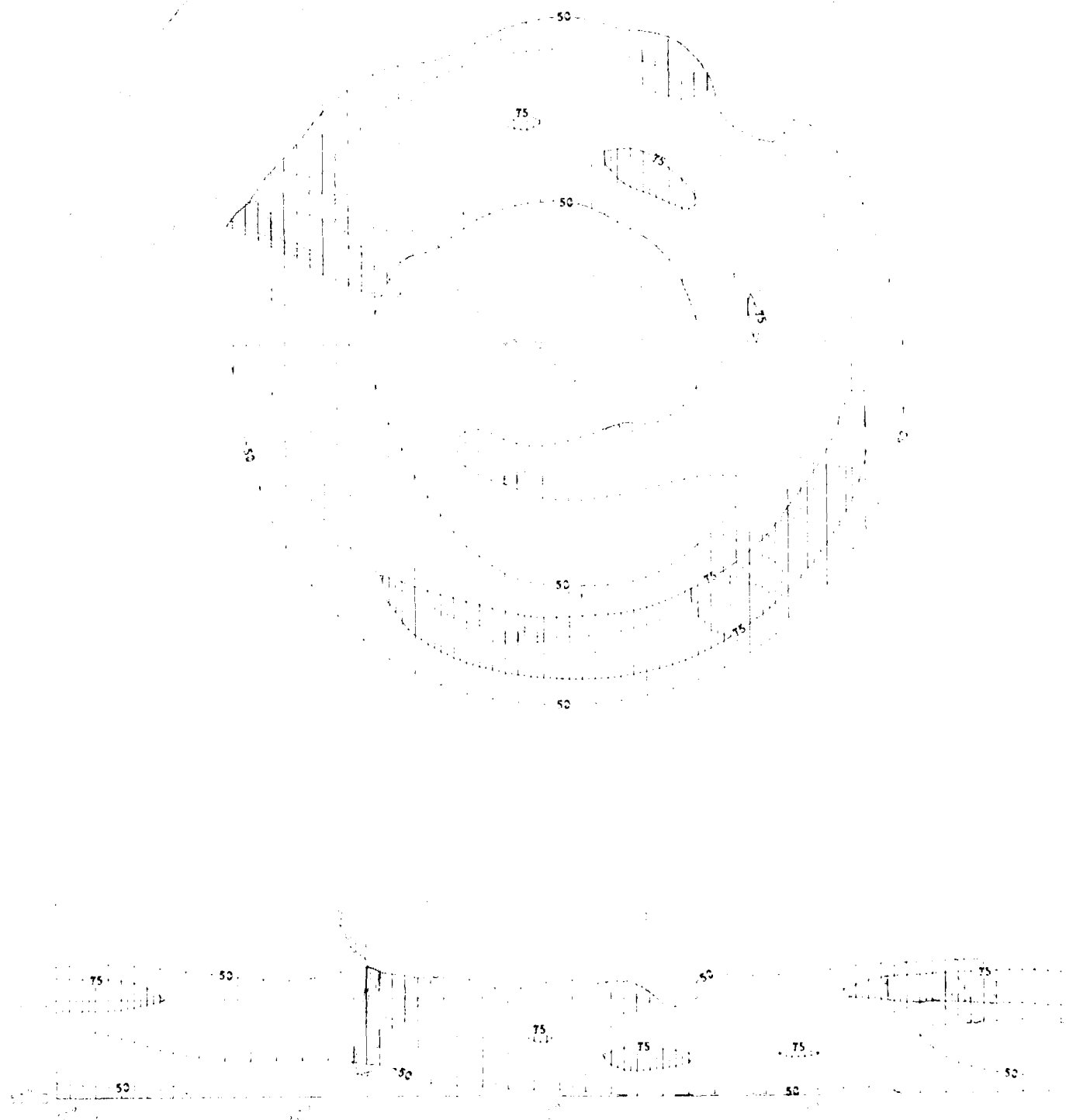
1st Stream
 2nd Stream
 3rd Stream
 4th Stream

Type and Quantity
 Northern Hemisphere



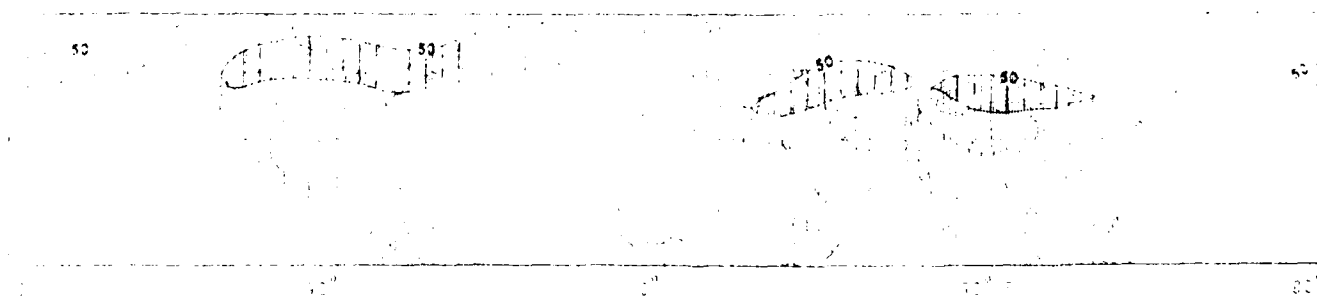
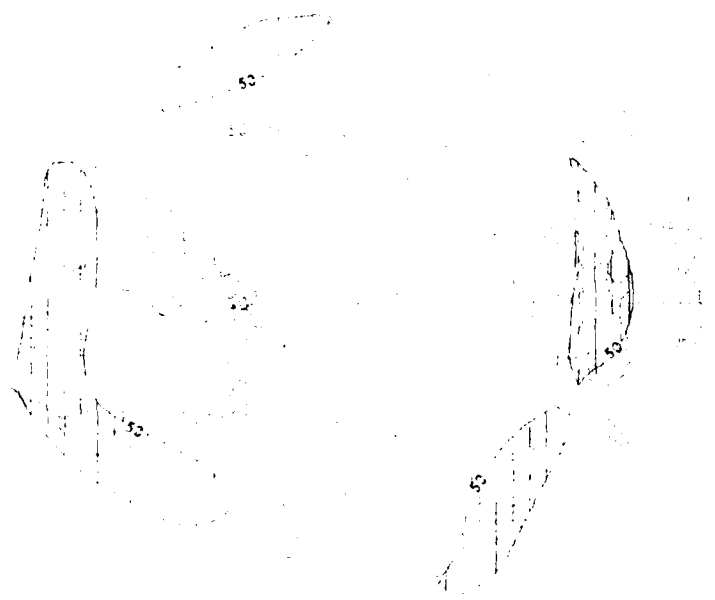
Upper Air Climatology
Southern Hemisphere

1st Decem.
Chart # 1000-100
1947
1000-100



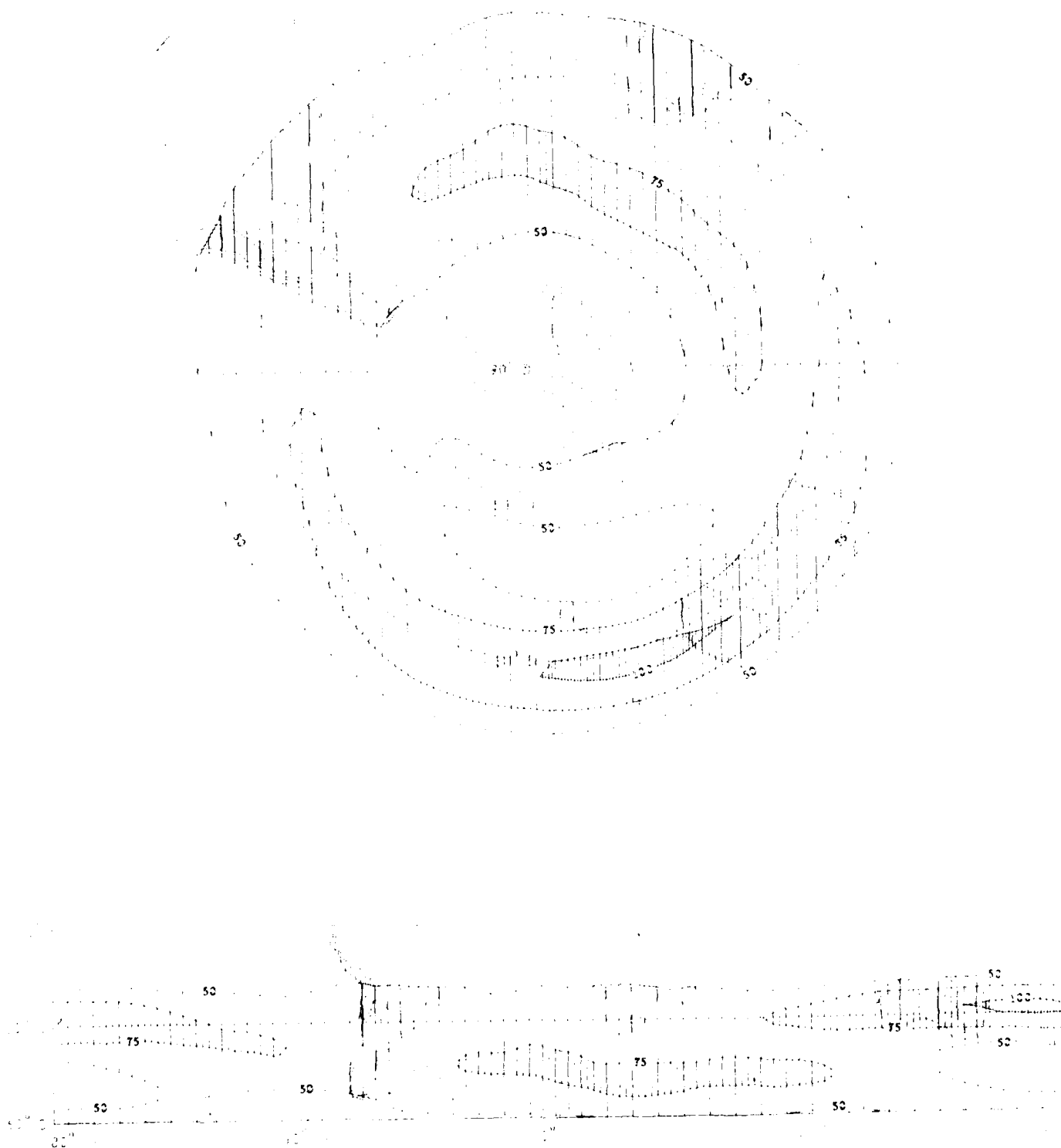
1st Stream
 61st + 62nd and
 63rd
 1st 100

Upper and Lower
 Northern Hemisphere



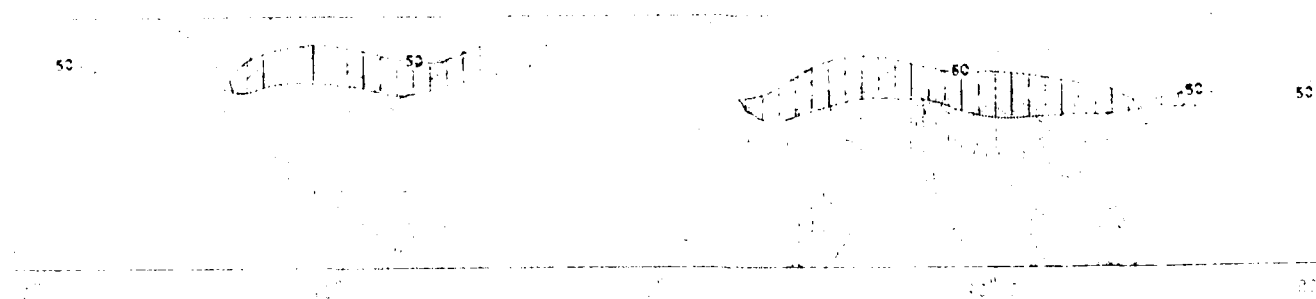
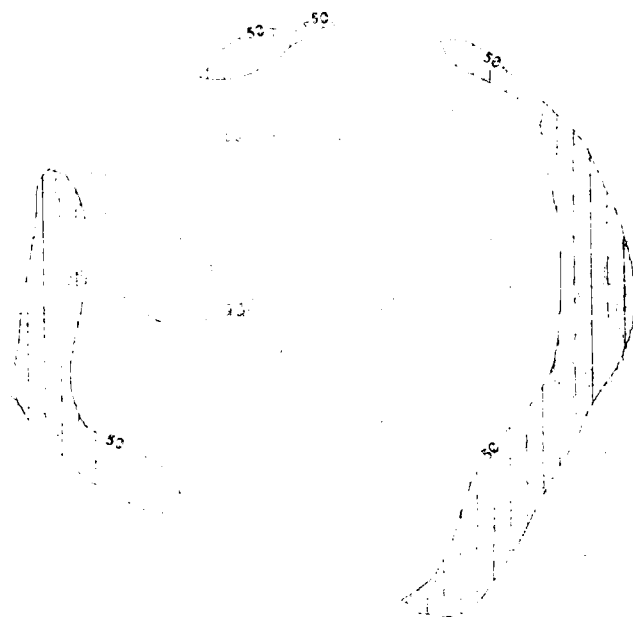
Upper and Intermediate
Crustal Homophones

1st Edition
1961 + 1962 and
1963
1964



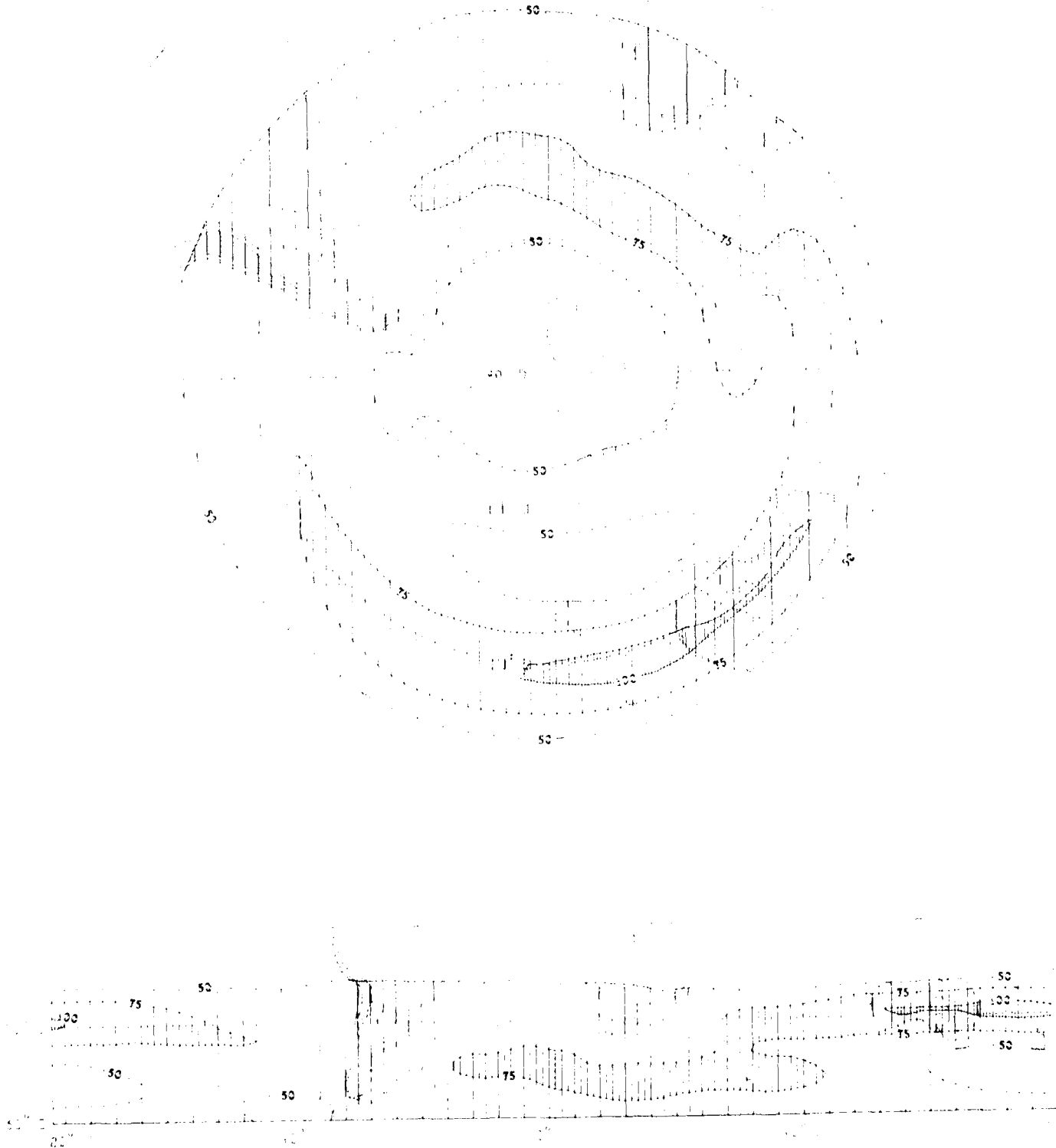
1st Stream
 2nd Stream
 3rd Stream
 4th Stream

Upper and Lower
 Northern Hemisphere



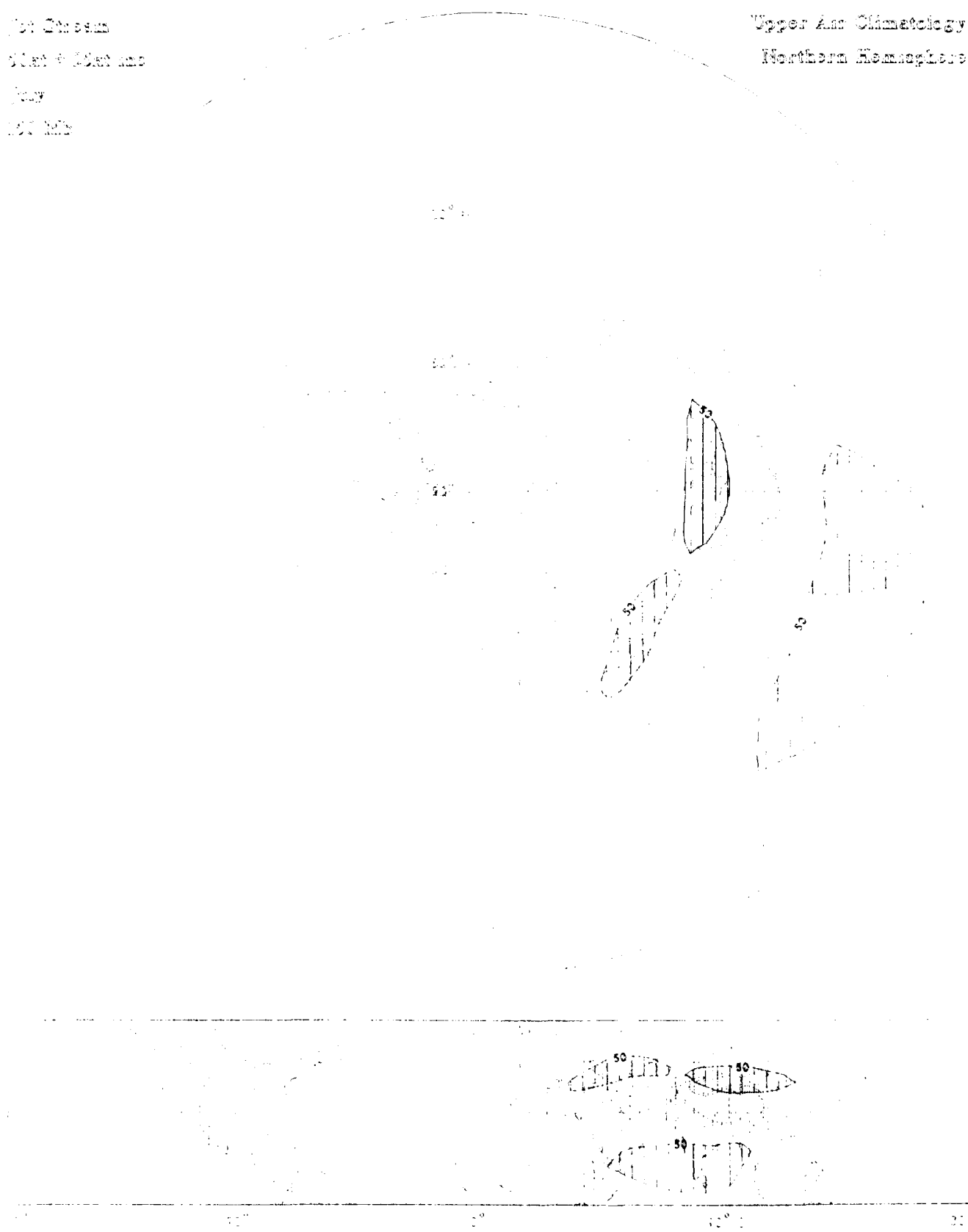
Topography and Climatology
Division Headquarters

100-000000
Class 1-000000
100-000000
100-000000



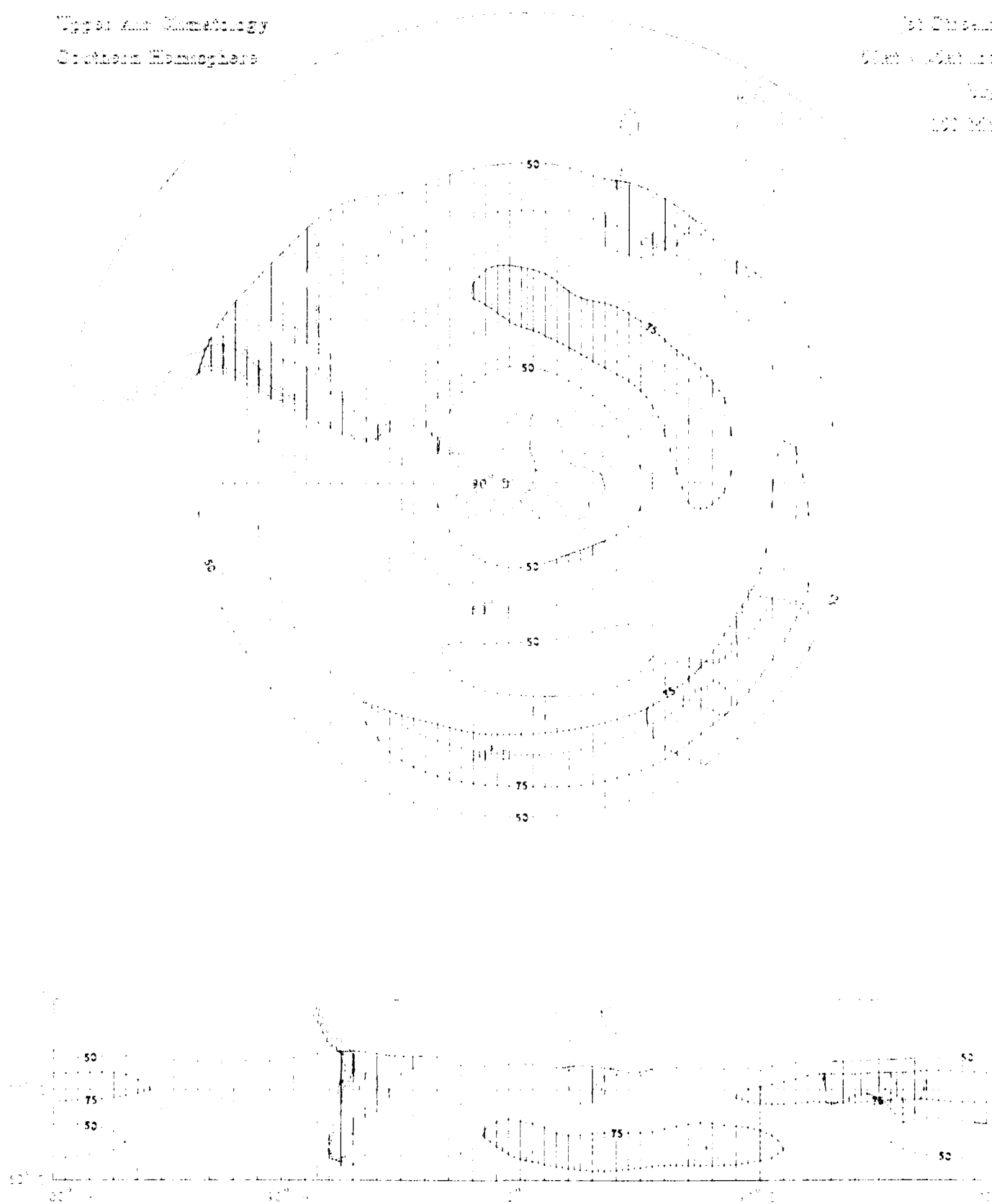
1000 mb
 1000 mb
 1000 mb
 1000 mb

Upper Air Climatology
 Northern Hemisphere



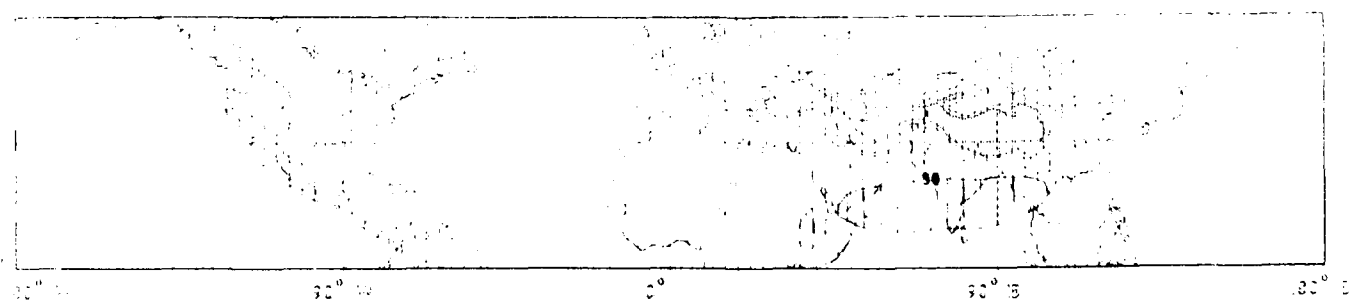
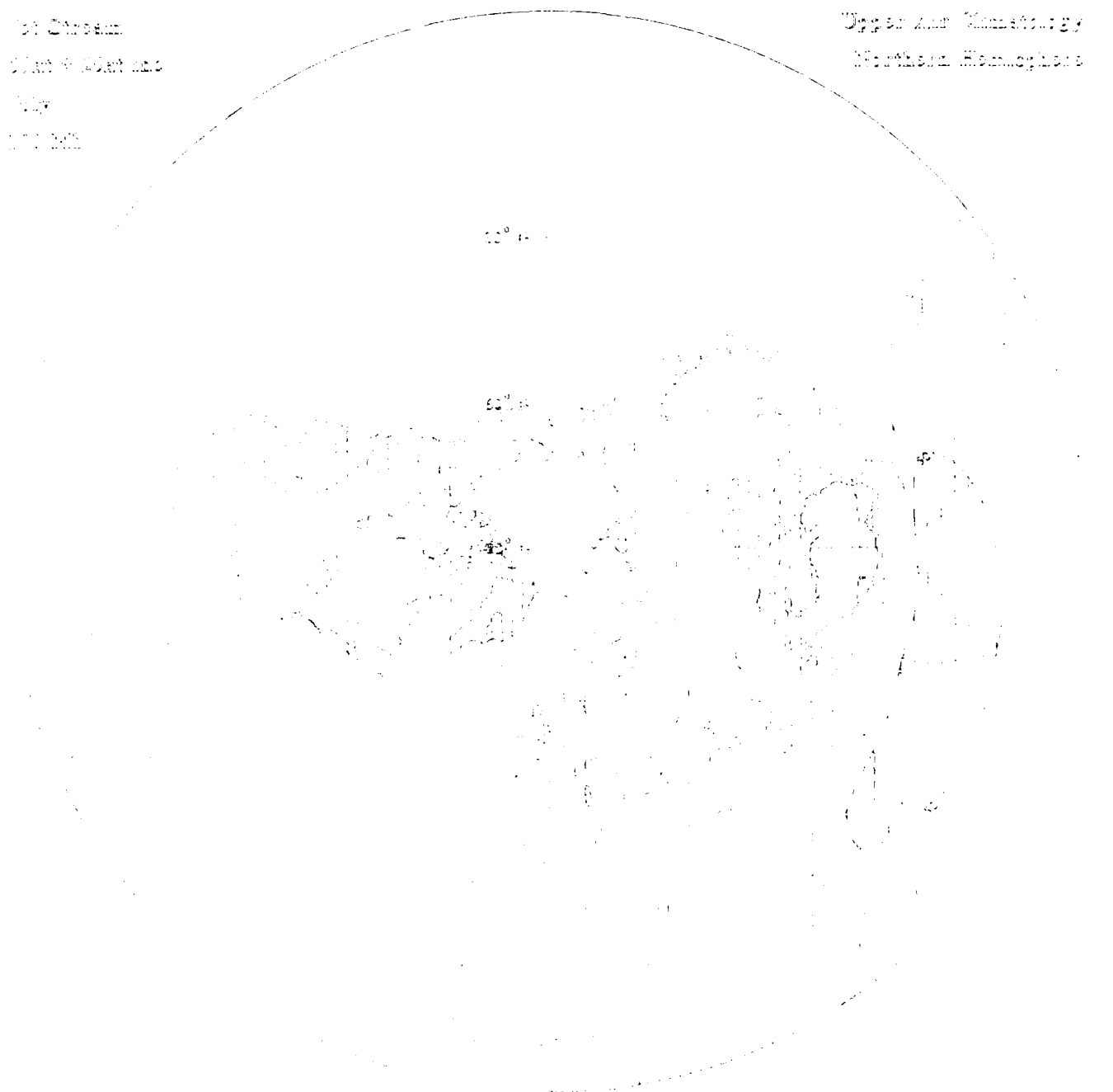
Upper Air Climatology
 Southern Hemisphere

500 mb
 500 mb
 500 mb
 500 mb



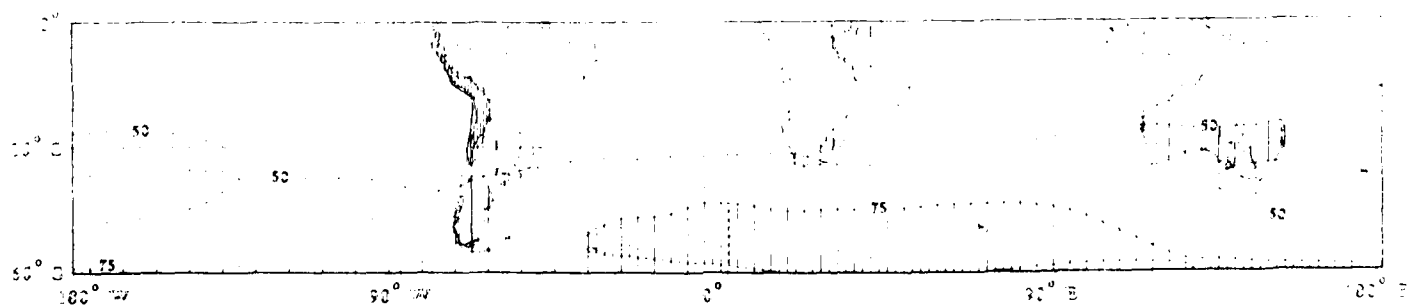
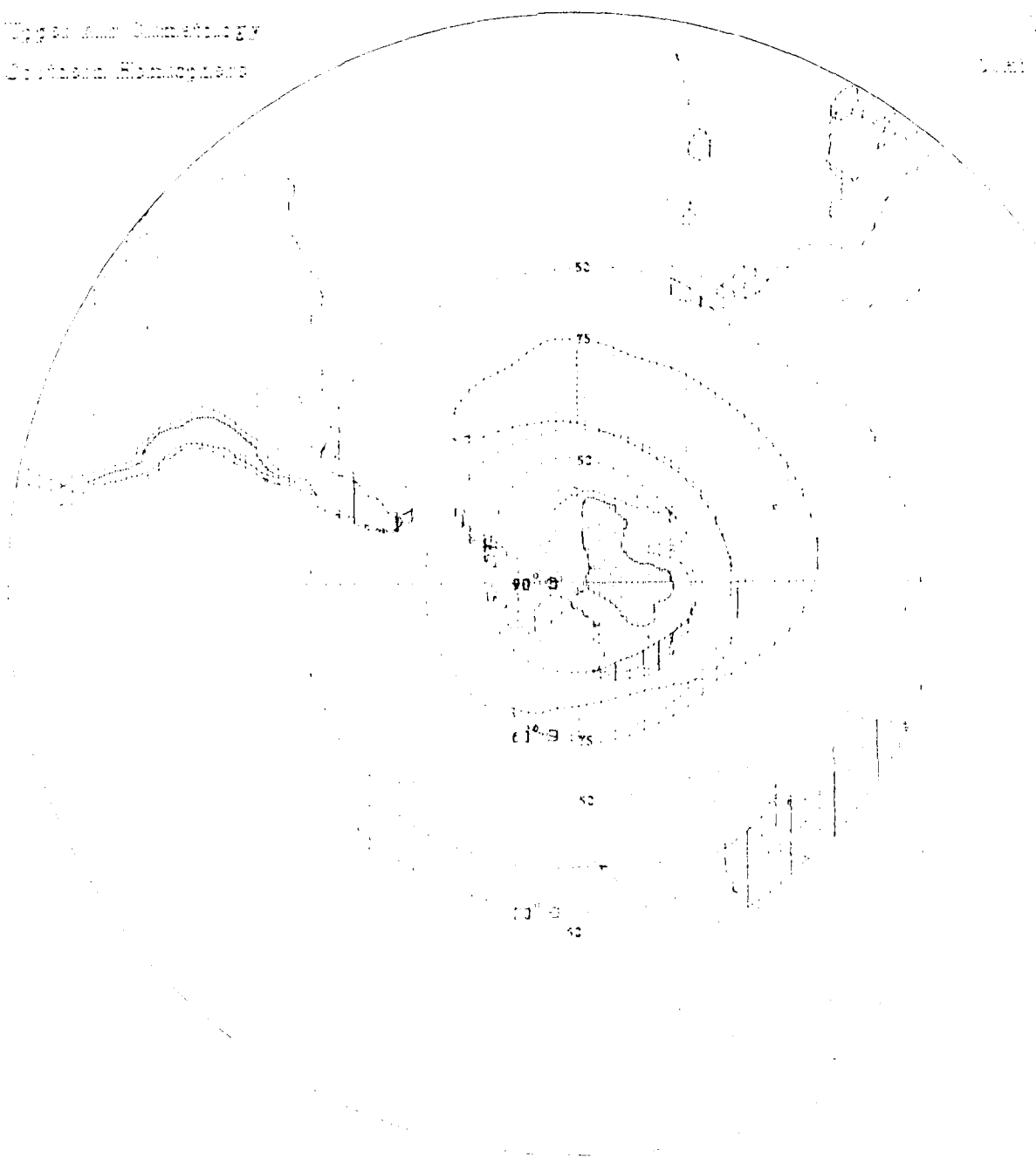
1st Stream
 2nd & 3rd and
 4th
 5th 2nd

Upper and Middle
 Northern Hemisphere



Types and Geometry
of Area Homographs

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



10 October

11 October

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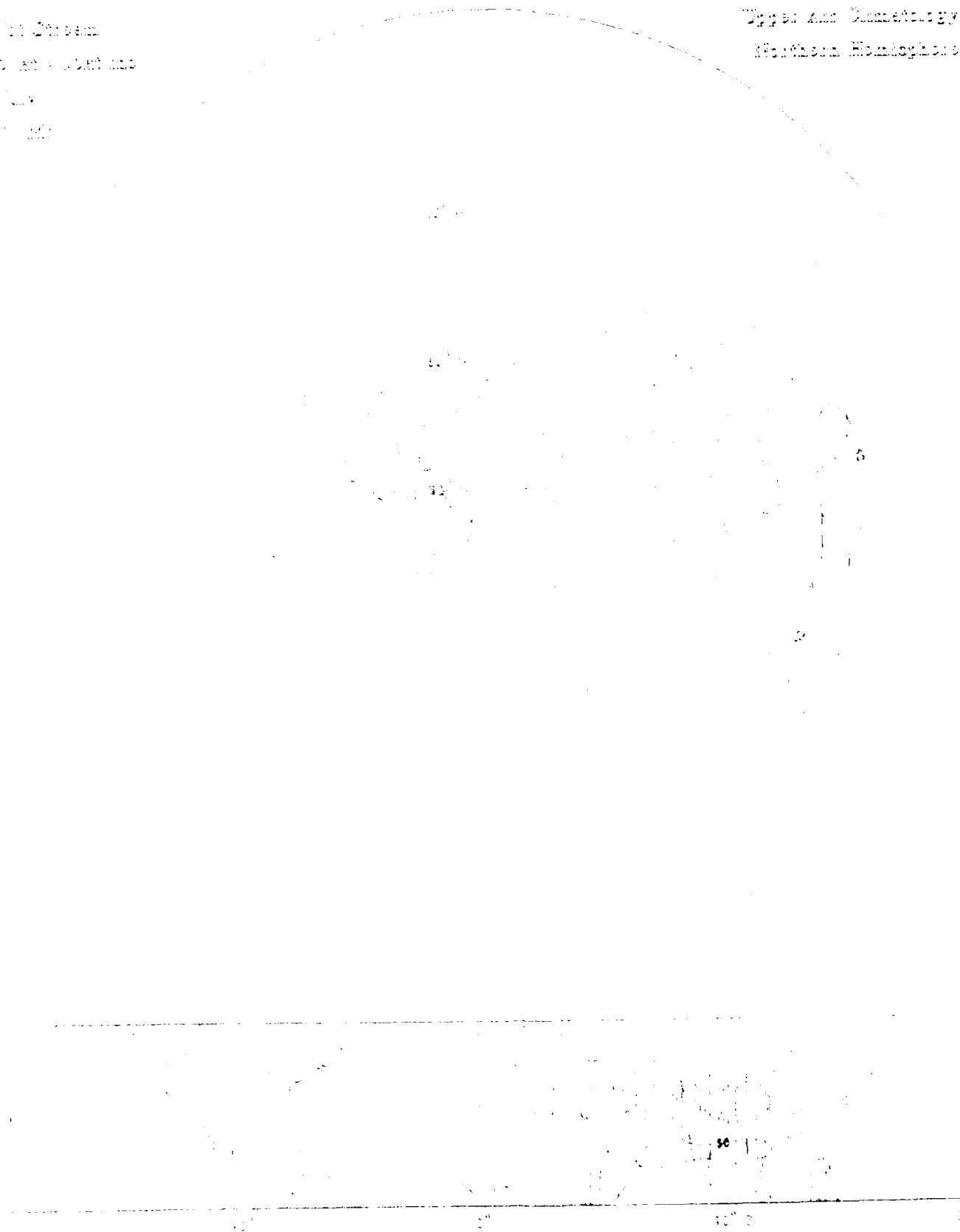
18

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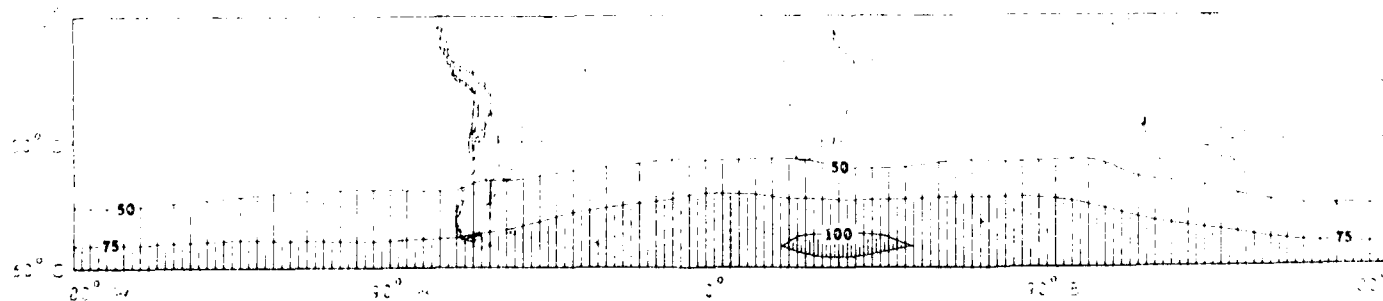
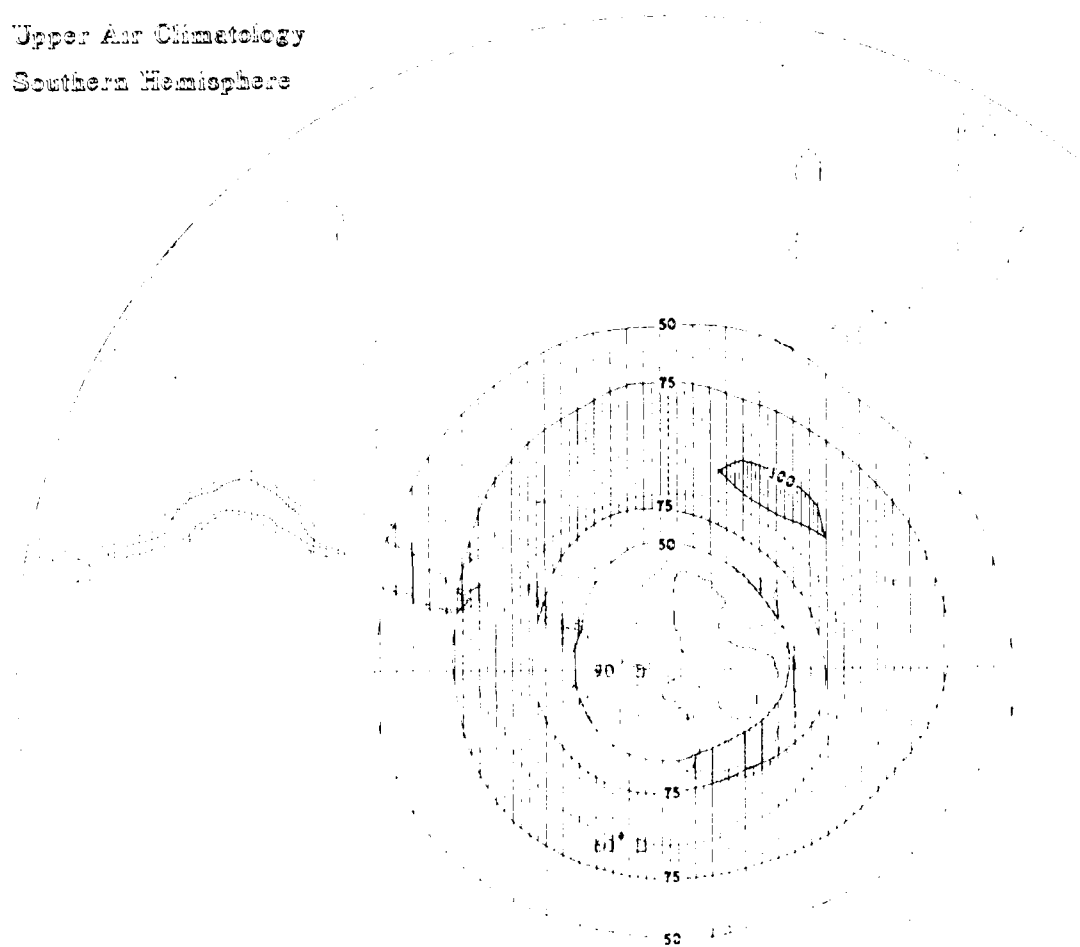
Upper Air Climatology

Horizontal Homogeneity



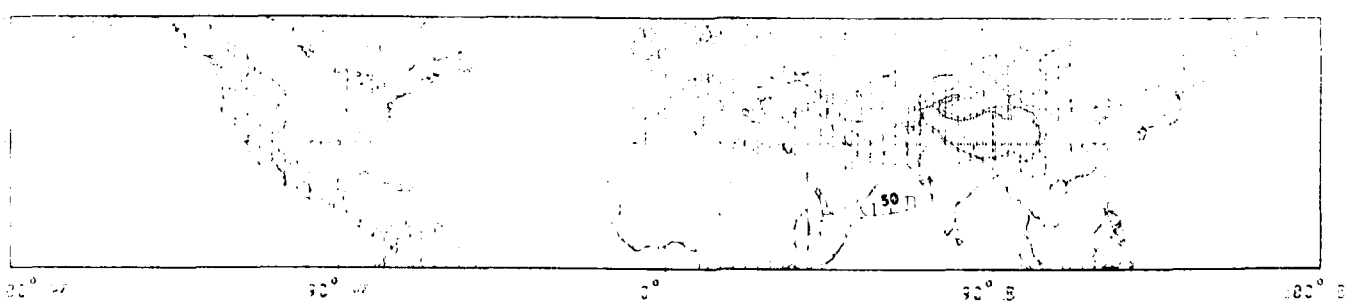
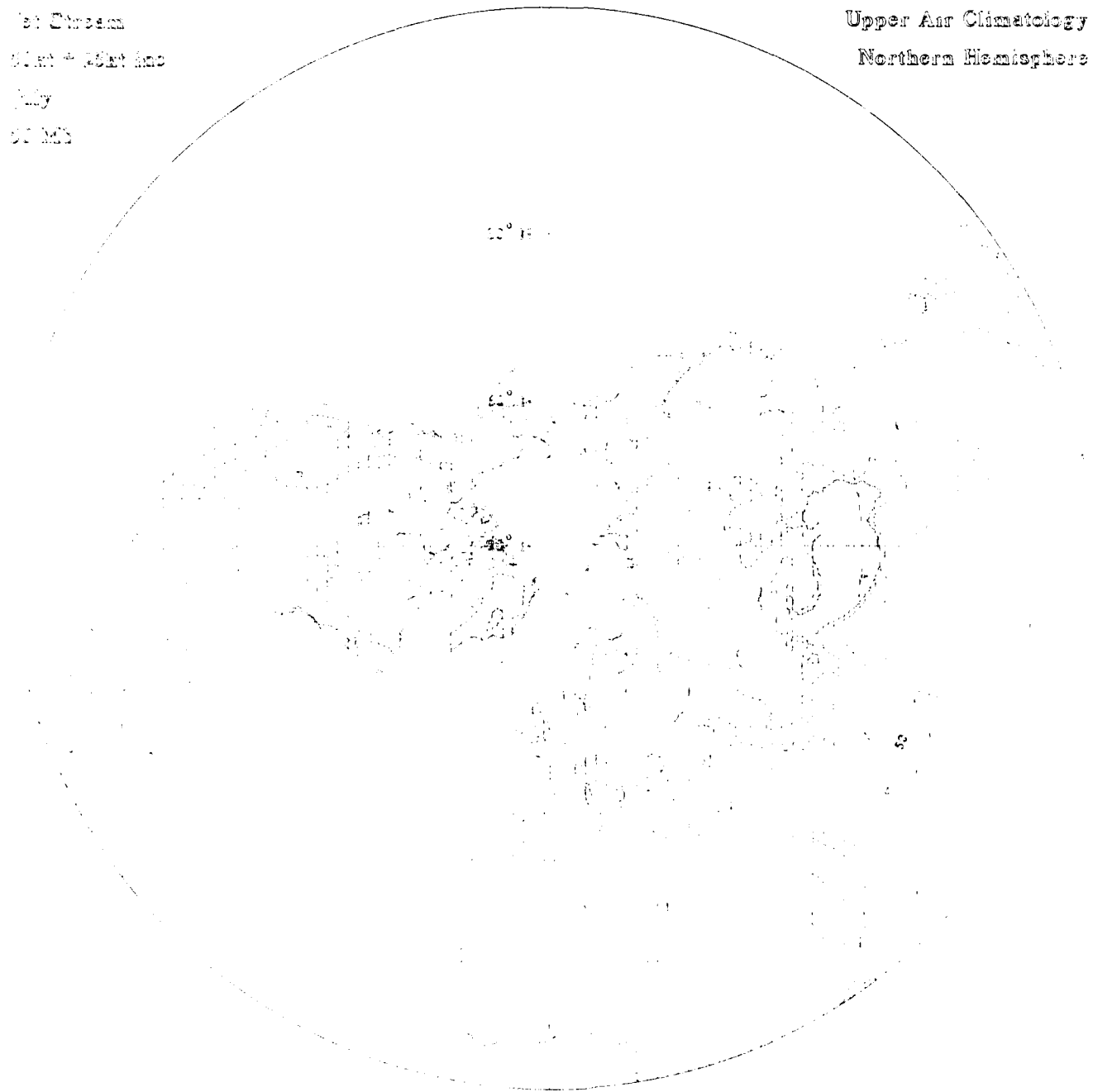
Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 20kt min
July
70 MB



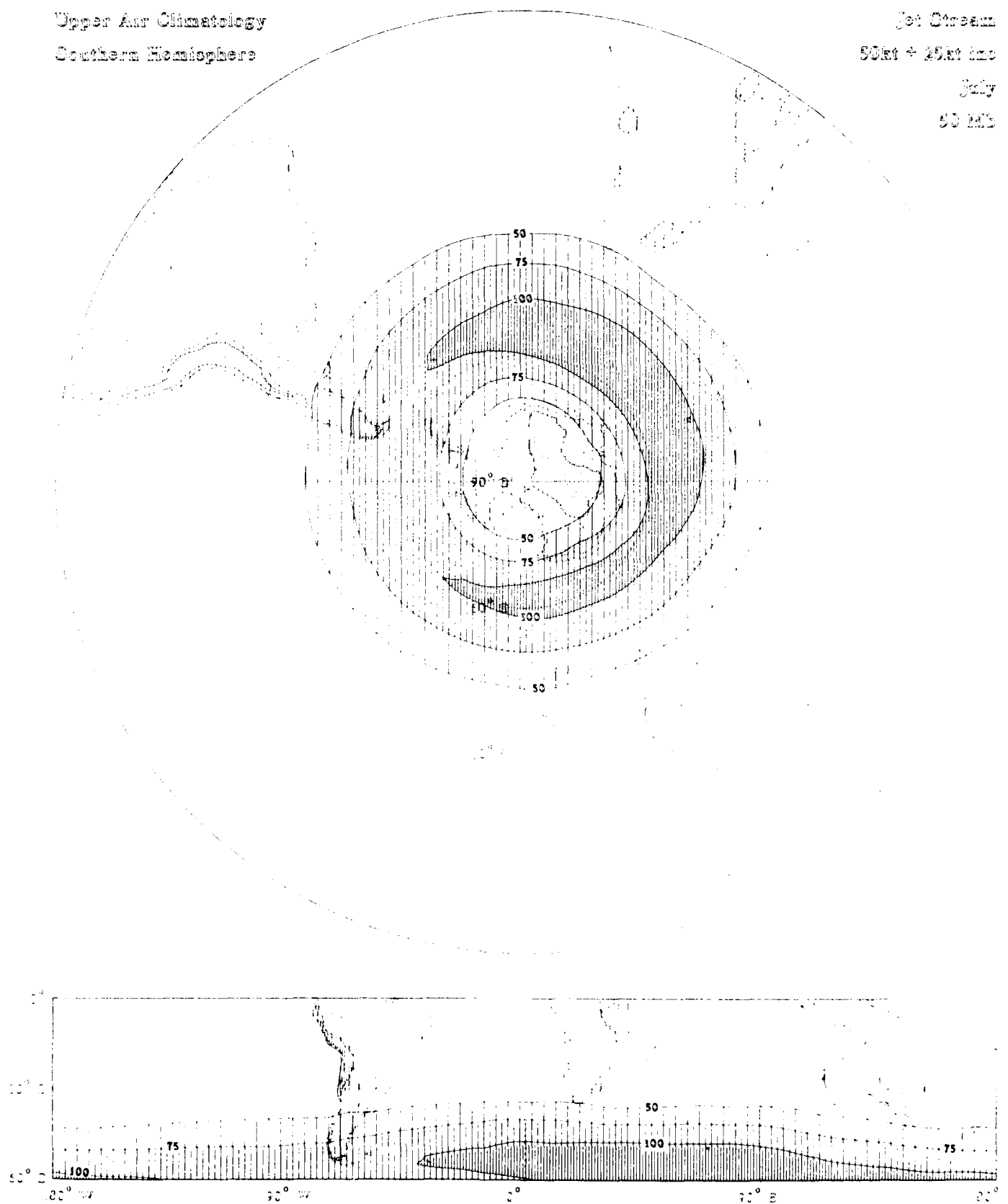
1st Stream
 1st + 2nd and
 3rd
 4th

Upper Air Climatology
 Northern Hemisphere



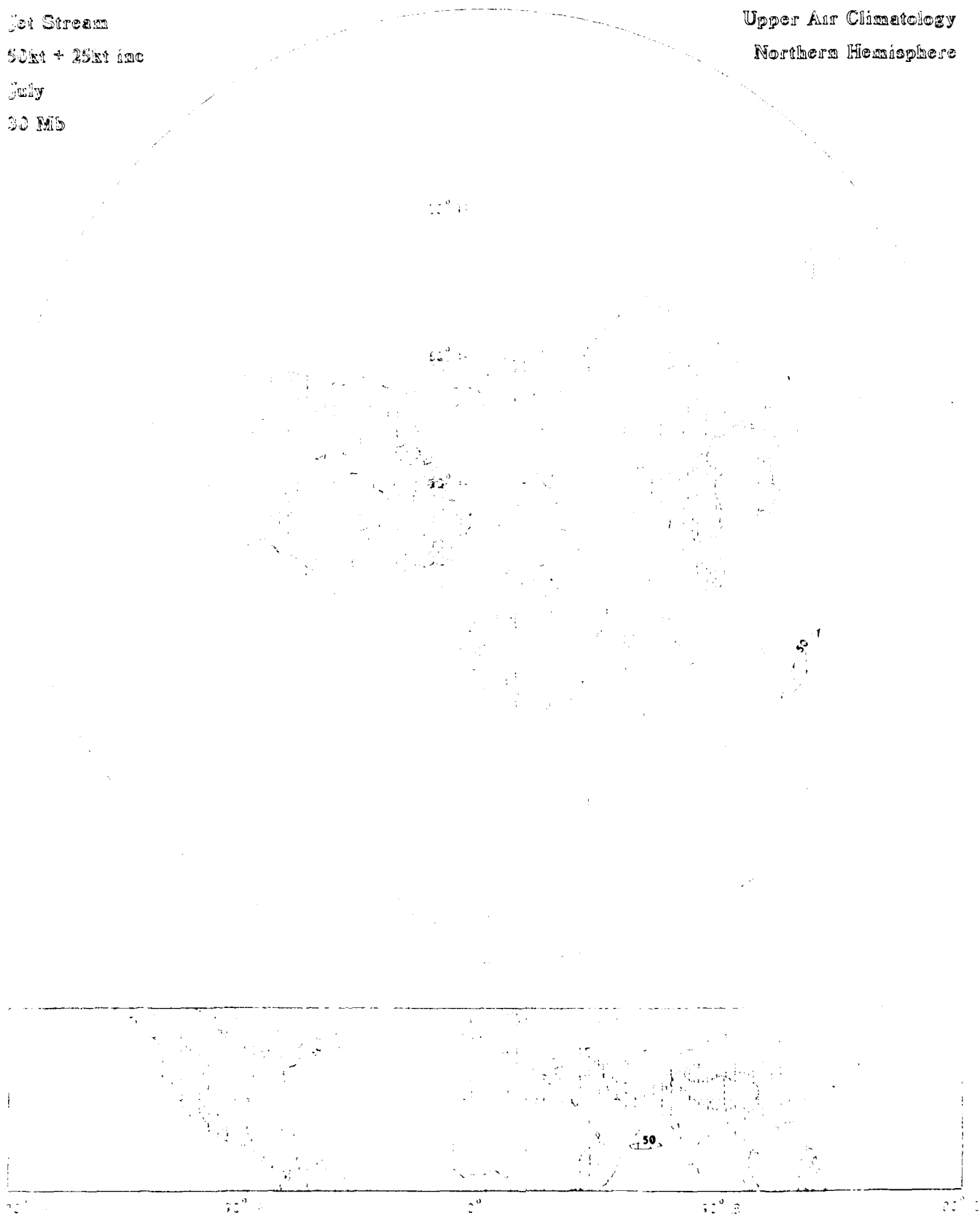
Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 25kt line
July
50 MB



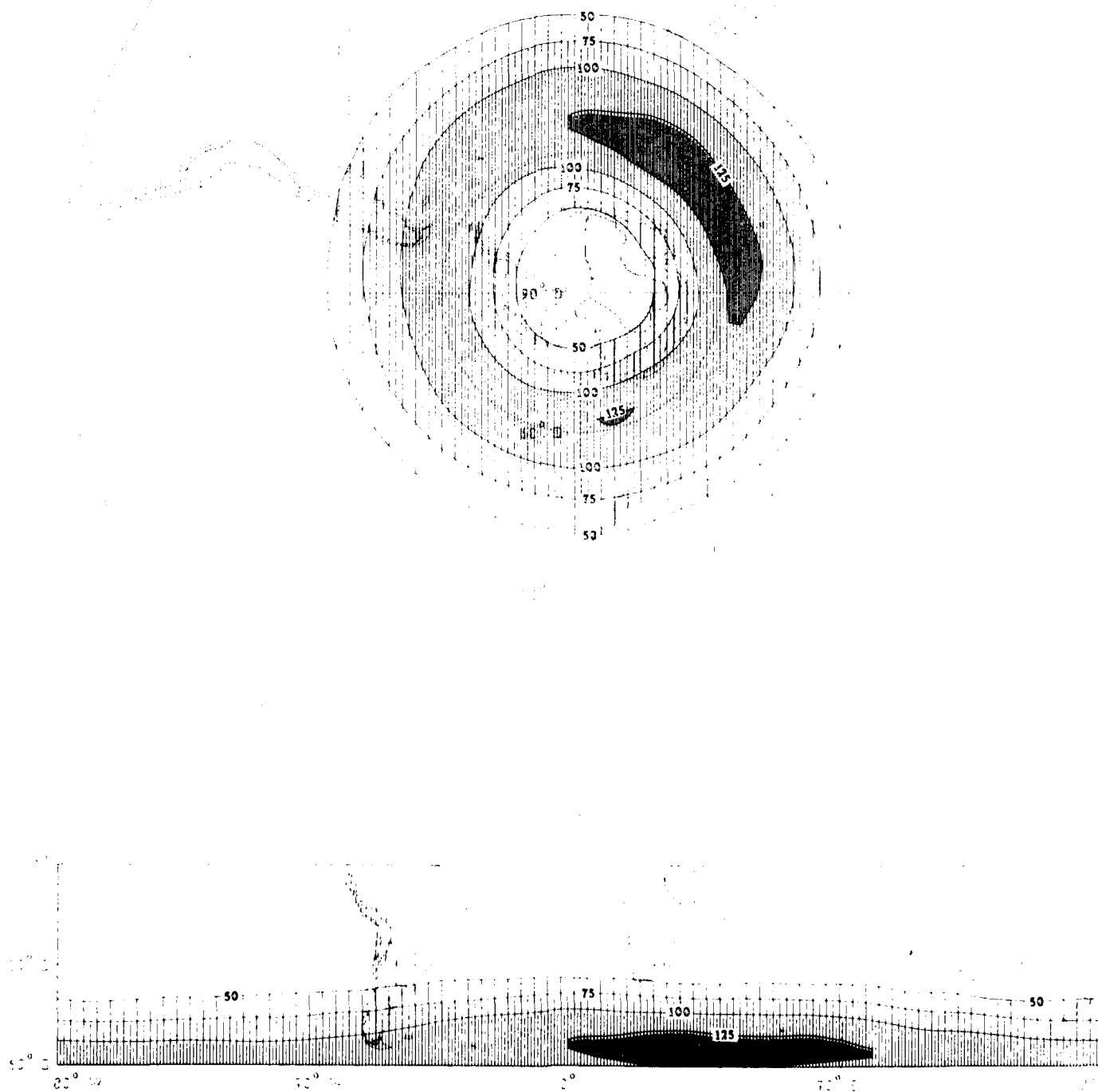
Jet Stream
50kt + 25kt inc
July
30 Mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 15kt line
Only
50 100



TEMPERATURE
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean temperature (solid and dashed lines) in °C; solids labeled, dashed intermediates unlabeled
- Temperature labeled interval: 5°C
- Contours of standard deviation of temperature (dotted lines) in °C
- Standard deviation of temperature labeled interval: 2.5°C
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE

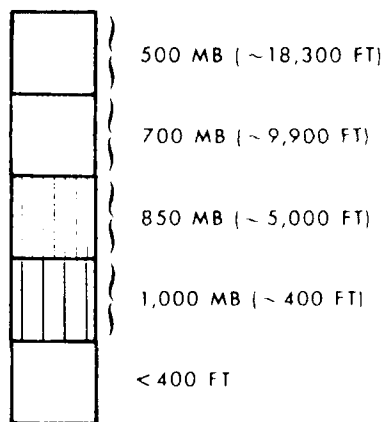


Figure 10: Map of the ...

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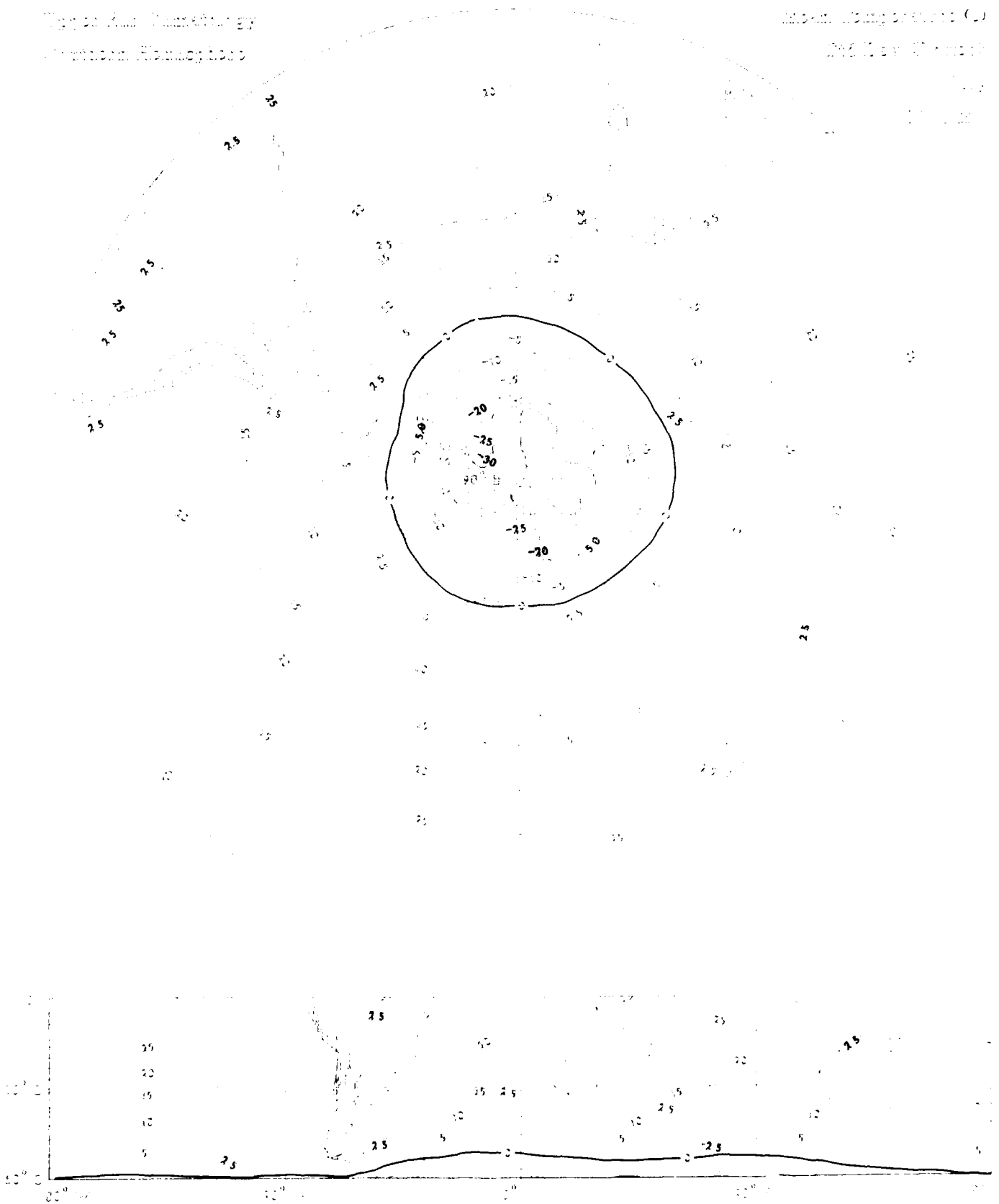
Figure 2.1. Contour map of
the total energy

of the system (J)

of the system (J)

of the system (J)

of the system (J)



Mean Temperature (°C)

10°C isotherm

15°C

20°C

Depth and Latitude

1000m isobath

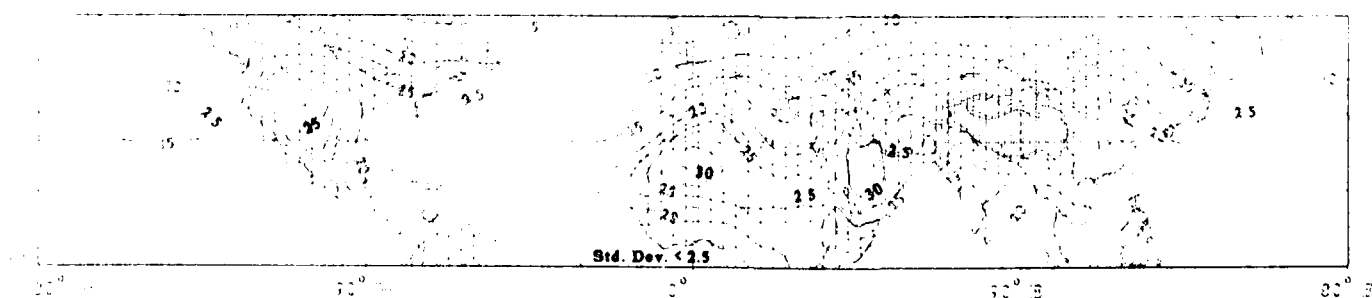
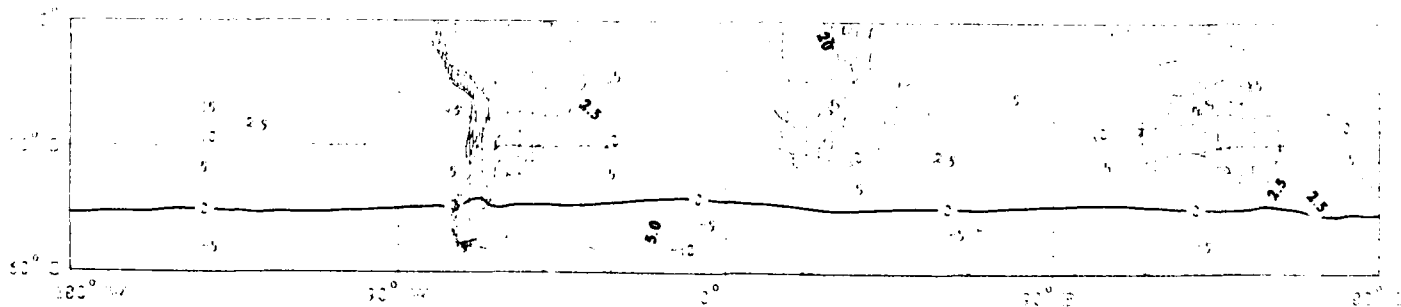
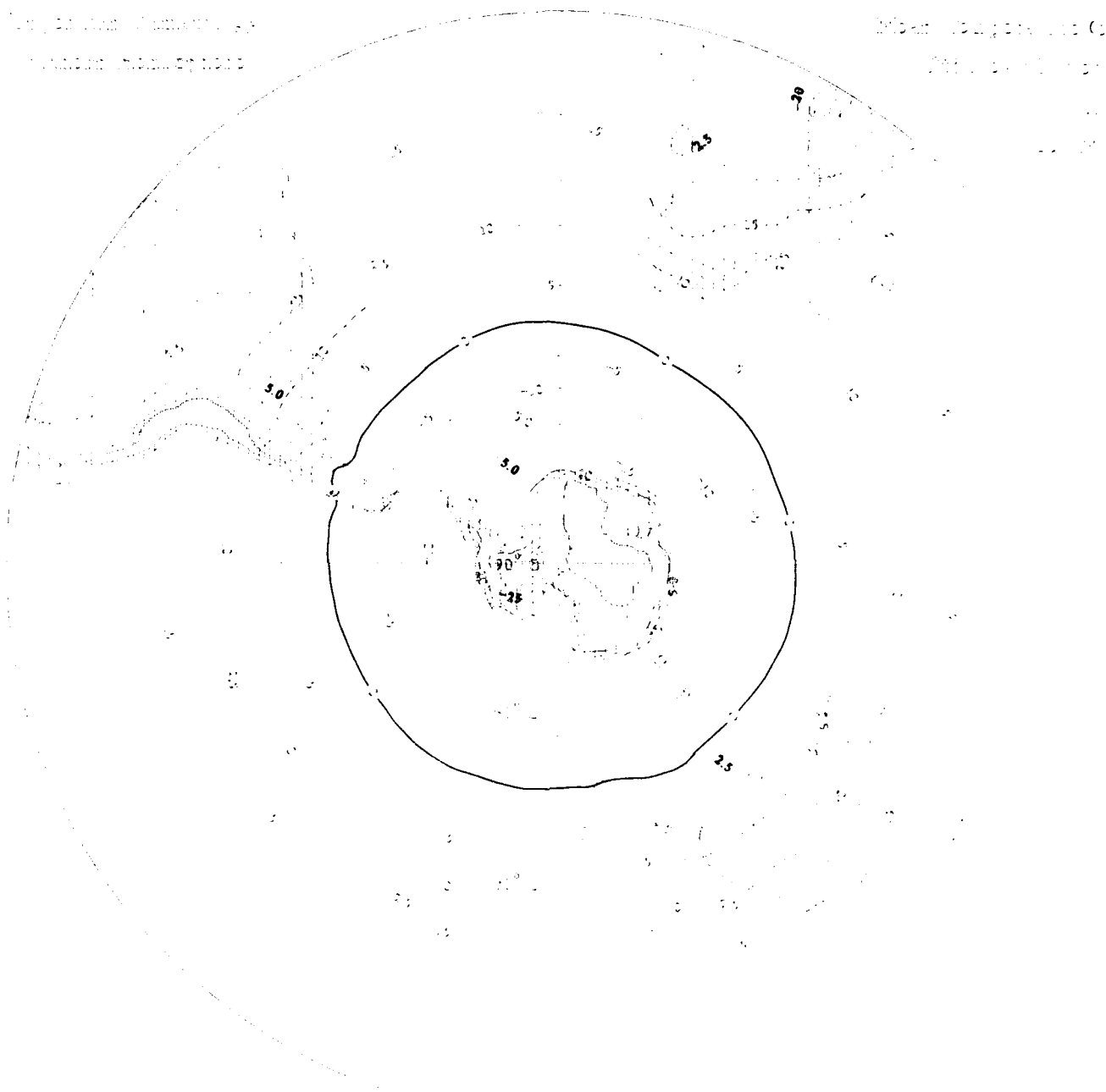


Figure 10. Contour Map of the Pacific Ocean

Contour Interval: 0.50

Figure 11. Contour Map of the Pacific Ocean

Contour Interval: 0.50



Upper Air Temperature (°C)

Upper Air Temperature

Standard Deviations

1000 mb

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

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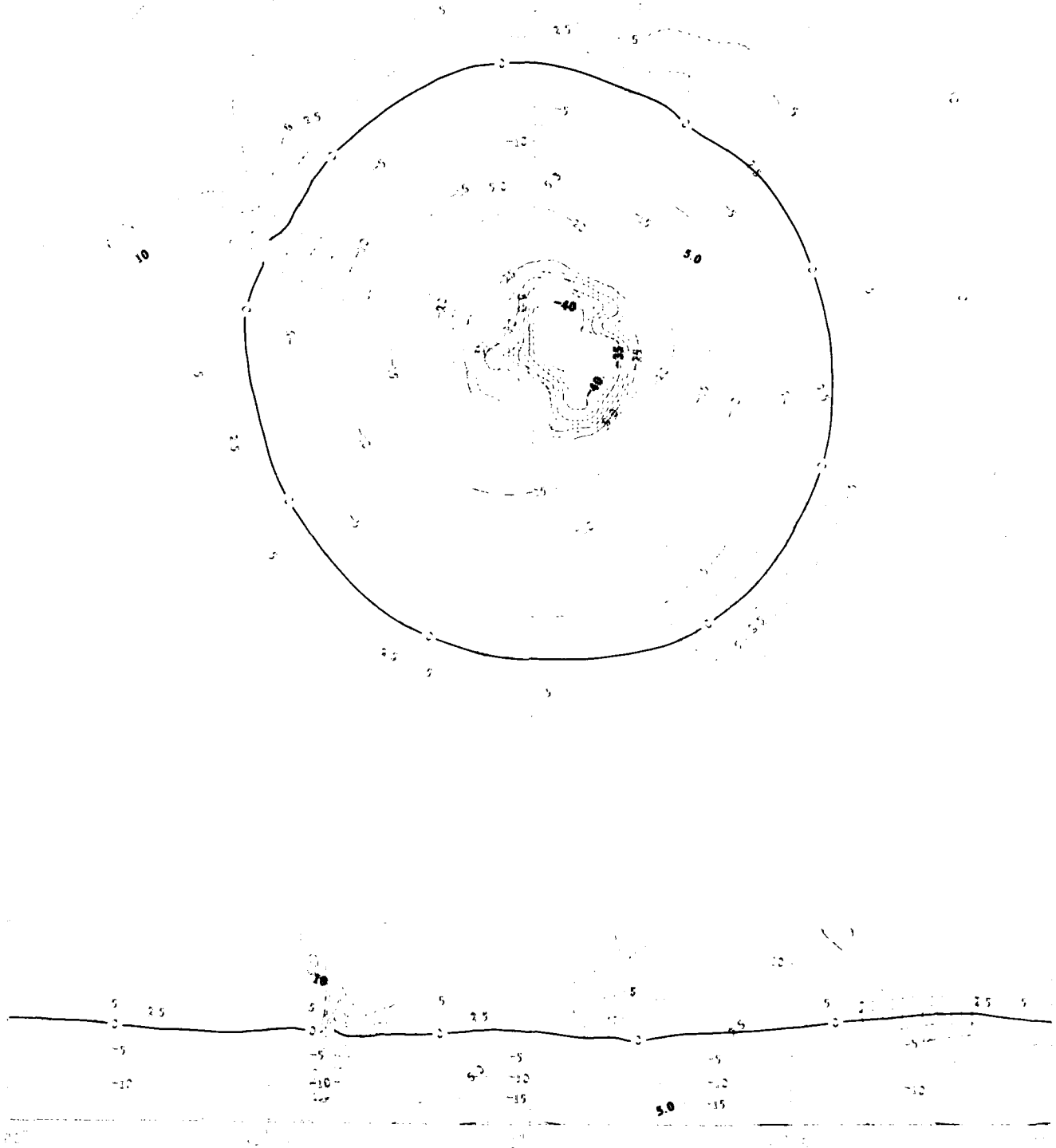
1000

Std. Dev. < 2.5

Std. Dev. < 2.5

Topical Meteorology
 of Western Hemisphere

Mean Temperature (°C)
 Oct-Mar (1960-61)
 1967
 1968



Mean Temperature (°C)

Sea Level Pressure

Wind

Clouds

Temperature (°C)

Sea Level Pressure

Wind

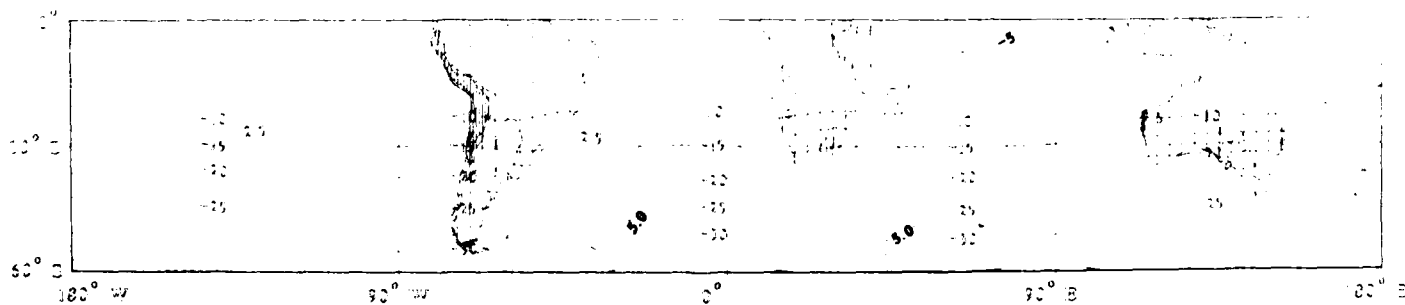
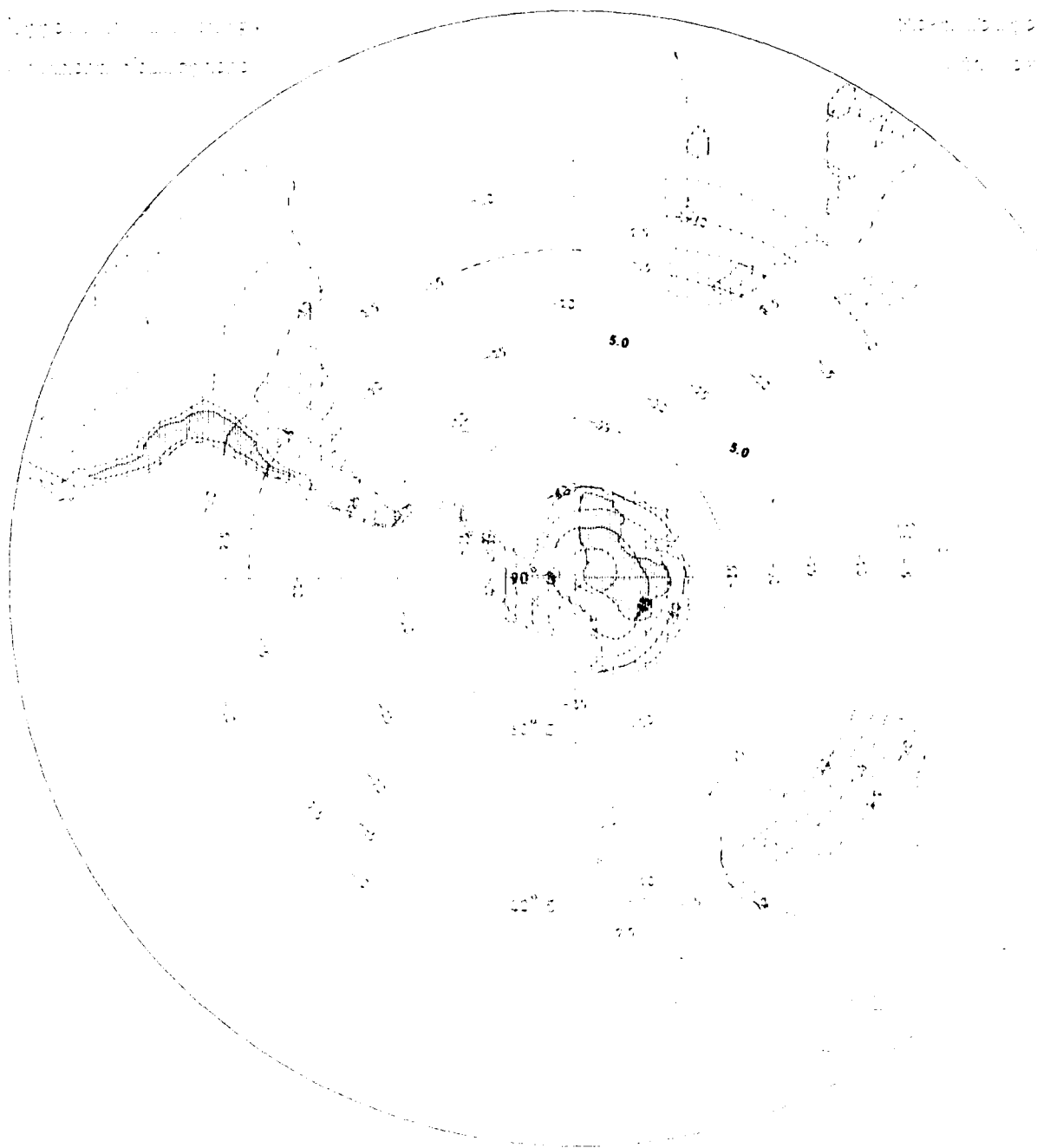
Clouds

Std. Dev. < 25

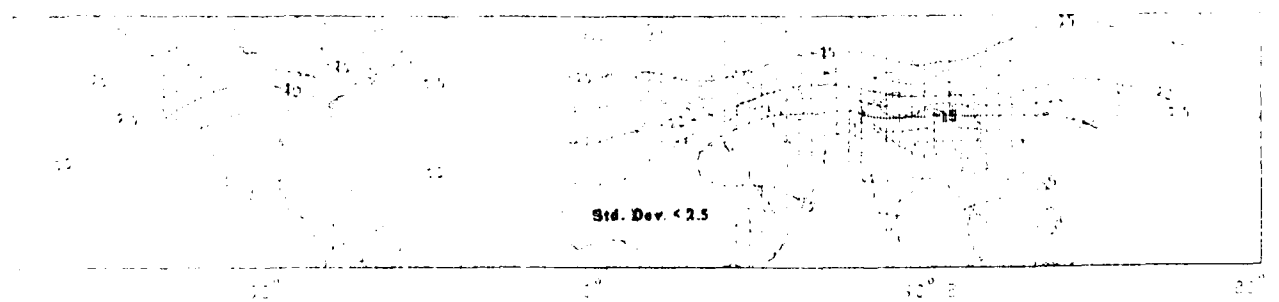
Std. Dev. < 25

Figure 1. (a) 1980-1981
 (b) 1982-1983

Figure 1. (c) 1984-1985
 (d) 1986-1987



1. *Pharmaceuticals* (1998) 10: 101-110.
 2. *Pharmaceuticals* (1999) 11: 101-110.
 3. *Pharmaceuticals* (2000) 12: 101-110.
 4. *Pharmaceuticals* (2001) 13: 101-110.
 5. *Pharmaceuticals* (2002) 14: 101-110.
 6. *Pharmaceuticals* (2003) 15: 101-110.
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 8. *Pharmaceuticals* (2005) 17: 101-110.
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 17. *Pharmaceuticals* (2014) 26: 101-110.
 18. *Pharmaceuticals* (2015) 27: 101-110.
 19. *Pharmaceuticals* (2016) 28: 101-110.
 20. *Pharmaceuticals* (2017) 29: 101-110.
 21. *Pharmaceuticals* (2018) 30: 101-110.
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 23. *Pharmaceuticals* (2020) 32: 101-110.
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 41. *Pharmaceuticals* (2038) 50: 101-110.
 42. *Pharmaceuticals* (2039) 51: 101-110.
 43. *Pharmaceuticals* (2040) 52: 101-110.
 44. *Pharmaceuticals* (2041) 53: 101-110.
 45. *Pharmaceuticals* (2042) 54: 101-110.
 46. *Pharmaceuticals* (2043) 55: 101-110.
 47. *Pharmaceuticals* (2044) 56: 101-110.
 48. *Pharmaceuticals* (2045) 57: 101-110.
 49. *Pharmaceuticals* (2046) 58: 101-110.
 50. *Pharmaceuticals* (2047) 59: 101-110.
 51. *Pharmaceuticals* (2048) 60: 101-110.
 52. *Pharmaceuticals* (2049) 61: 101-110.
 53. *Pharmaceuticals* (2050) 62: 101-110.
 54. *Pharmaceuticals* (2051) 63: 101-110.
 55. *Pharmaceuticals* (2052) 64: 101-110.
 56. *Pharmaceuticals* (2053) 65: 101-110.
 57. *Pharmaceuticals* (2054) 66: 101-110.
 58. *Pharmaceuticals* (2055) 67: 101-110.
 59. *Pharmaceuticals* (2056) 68: 101-110.
 60. *Pharmaceuticals* (2057) 69: 101-110.
 61. *Pharmaceuticals* (2058) 70: 101-110.
 62. *Pharmaceuticals* (2059) 71: 101-110.
 63. *Pharmaceuticals* (2060) 72: 101-110.
 64. *Pharmaceuticals* (2061) 73: 101-110.
 65. *Pharmaceuticals* (2062) 74: 101-110.
 66. *Pharmaceuticals* (2063) 75: 101-110.
 67. *Pharmaceuticals* (2064) 76: 101-110.
 68. *Pharmaceuticals* (2065) 77: 101-110.
 69. *Pharmaceuticals* (2066) 78: 101-110.
 70. *Pharmaceuticals* (2067) 79: 101-110.
 71. *Pharmaceuticals* (2068) 80: 101-110.
 72. *Pharmaceuticals* (2069) 81: 101-110.
 73. *Pharmaceuticals* (2070) 82: 101-110.
 74. *Pharmaceuticals* (2071) 83: 101-110.
 75. *Pharmaceuticals* (2072) 84: 101-110.
 76. *Pharmaceuticals* (2073) 85: 101-110.
 77. *Pharmaceuticals* (2074) 86: 101-110.
 78. *Pharmaceuticals* (2075) 87: 101-110.
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 80. *Pharmaceuticals* (2077) 89: 101-110.
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 82. *Pharmaceuticals* (2079) 91: 101-110.
 83. *Pharmaceuticals* (2080) 92: 101-110.
 84. *Pharmaceuticals* (2081) 93: 101-110.
 85. *Pharmaceuticals* (2082) 94: 101-110.
 86. *Pharmaceuticals* (2083) 95: 101-110.
 87. *Pharmaceuticals* (2084) 96: 101-110.
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 89. *Pharmaceuticals* (2086) 98: 101-110.
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 91. *Pharmaceuticals* (2088) 100: 101-110.
 92. *Pharmaceuticals* (2089) 101: 101-110.
 93. *Pharmaceuticals* (2090) 102: 101-110.
 94. *Pharmaceuticals* (2091) 103: 101-110.
 95. *Pharmaceuticals* (2092) 104: 101-110.
 96. *Pharmaceuticals* (2093) 105: 101-110.
 97. *Pharmaceuticals* (2094) 106: 101-110.
 98. *Pharmaceuticals* (2095) 107: 101-110.
 99. *Pharmaceuticals* (2096) 108: 101-110.
 100. *Pharmaceuticals* (2097) 109: 101-110.
 101. *Pharmaceuticals* (2098) 110: 101-110.
 102. *Pharmaceuticals* (2099) 111: 101-110.
 103. *Pharmaceuticals* (2100) 112: 101-110.
 104. *Pharmaceuticals* (2101) 113: 101-110.
 105. *Pharmaceuticals* (2102) 114: 101-110.
 106. *Pharmaceuticals* (2103) 115: 101-110.
 107. *Pharmaceuticals* (2104) 116: 101-110.
 108. *Pharmaceuticals* (2105) 117: 101-110.
 109. *Pharmaceuticals* (2106) 118: 101-110.
 110. *Pharmaceuticals* (2107) 119: 101-110.



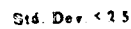
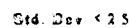


Figure 1. (a)

1000 hPa

1000

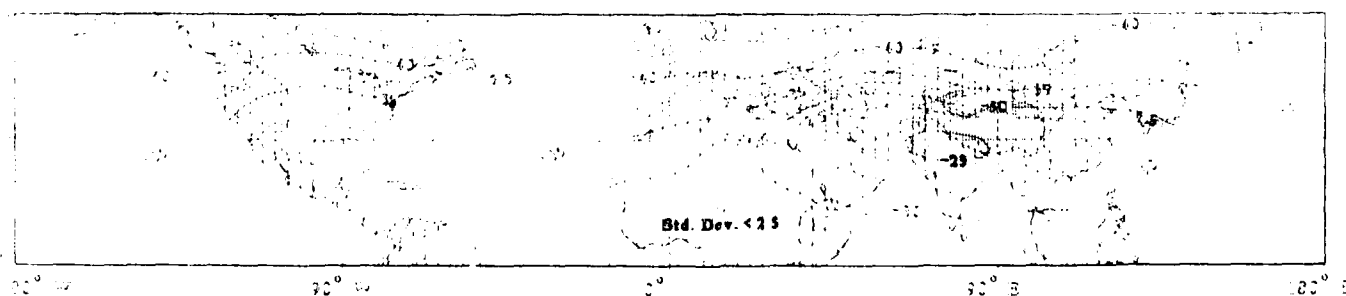
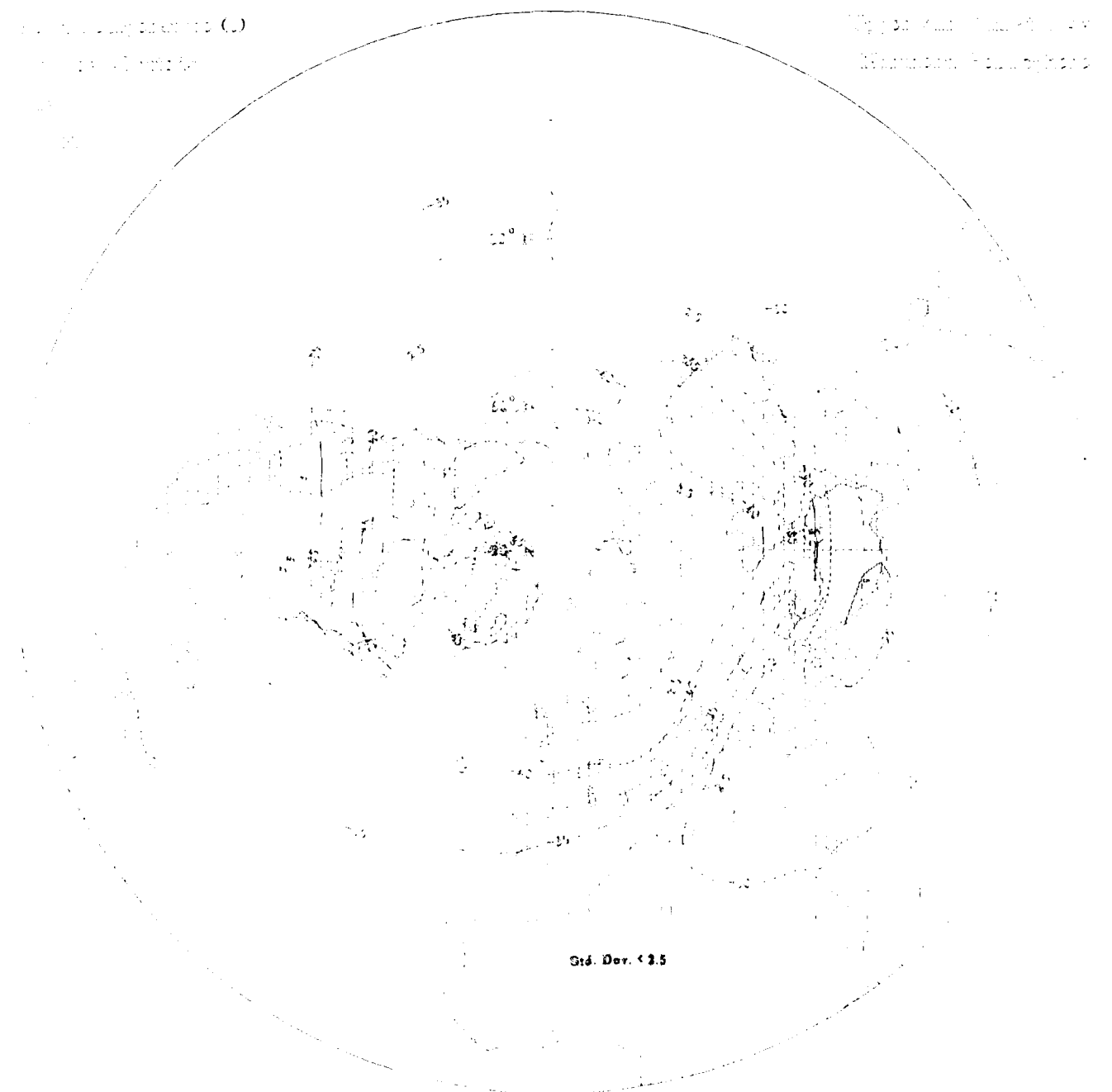
1000

Figure 1. (b)

1000 hPa

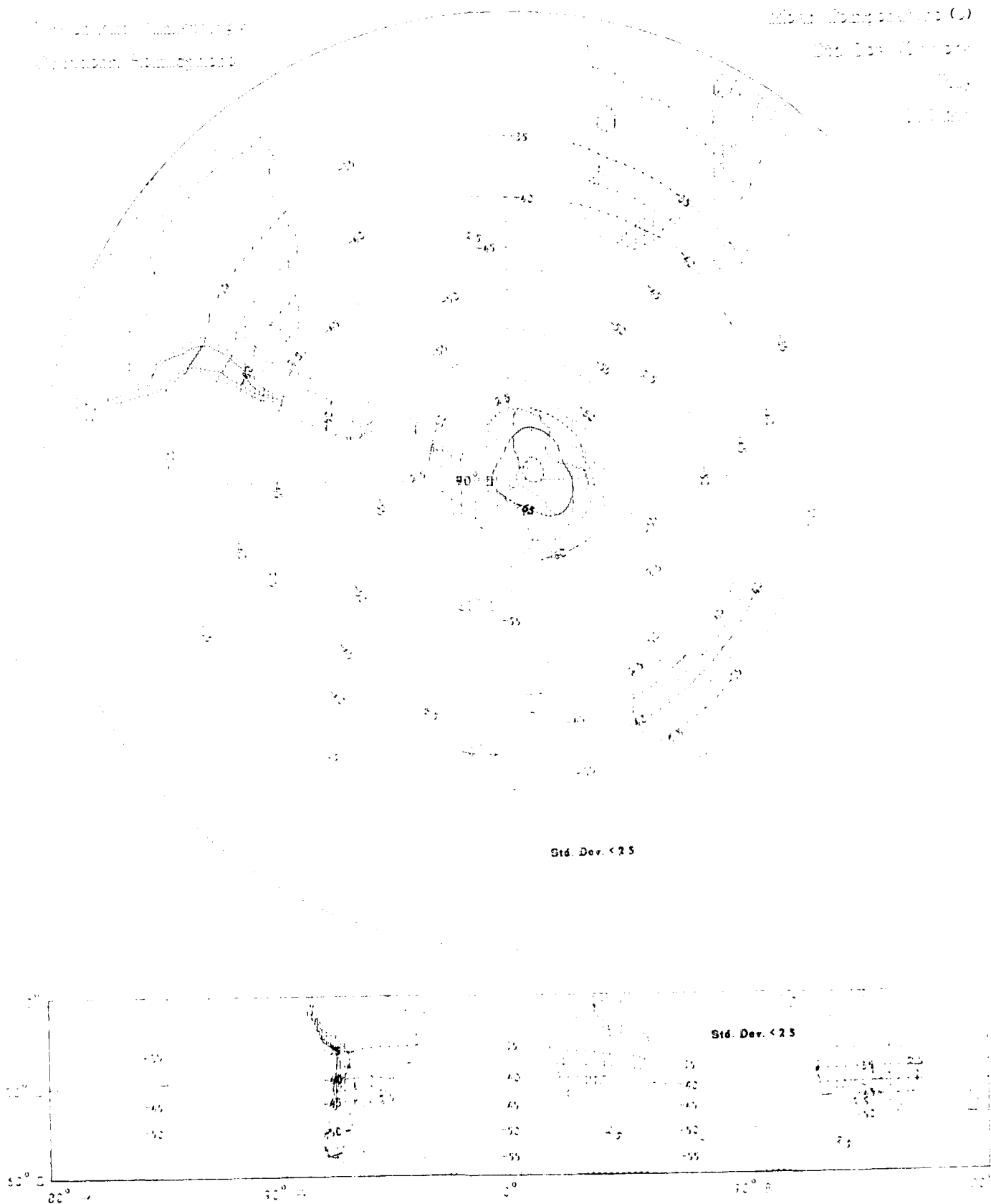
1000

1000



Temperature Contouring
 Oceanic Fronting

Mean Temperature (°C)
 Date: 15-11-1977
 Time: 11:00
 Loc: 111.20°E



Mean Temperature (°C)

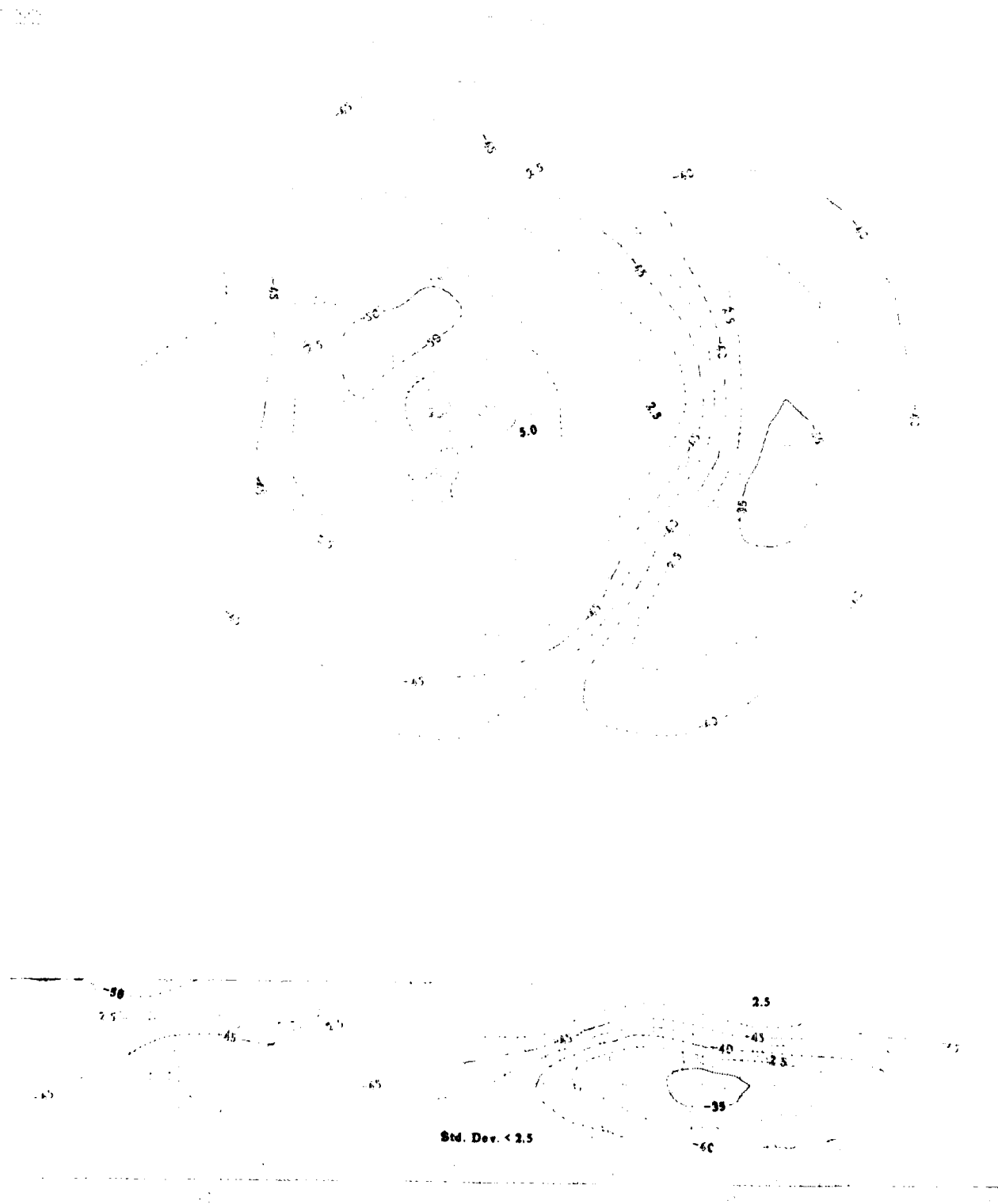
Sea Level Pressure

Wind

Clouds

Top of Air Mass Boundary

Frontal Discontinuity



Top of the Mountains

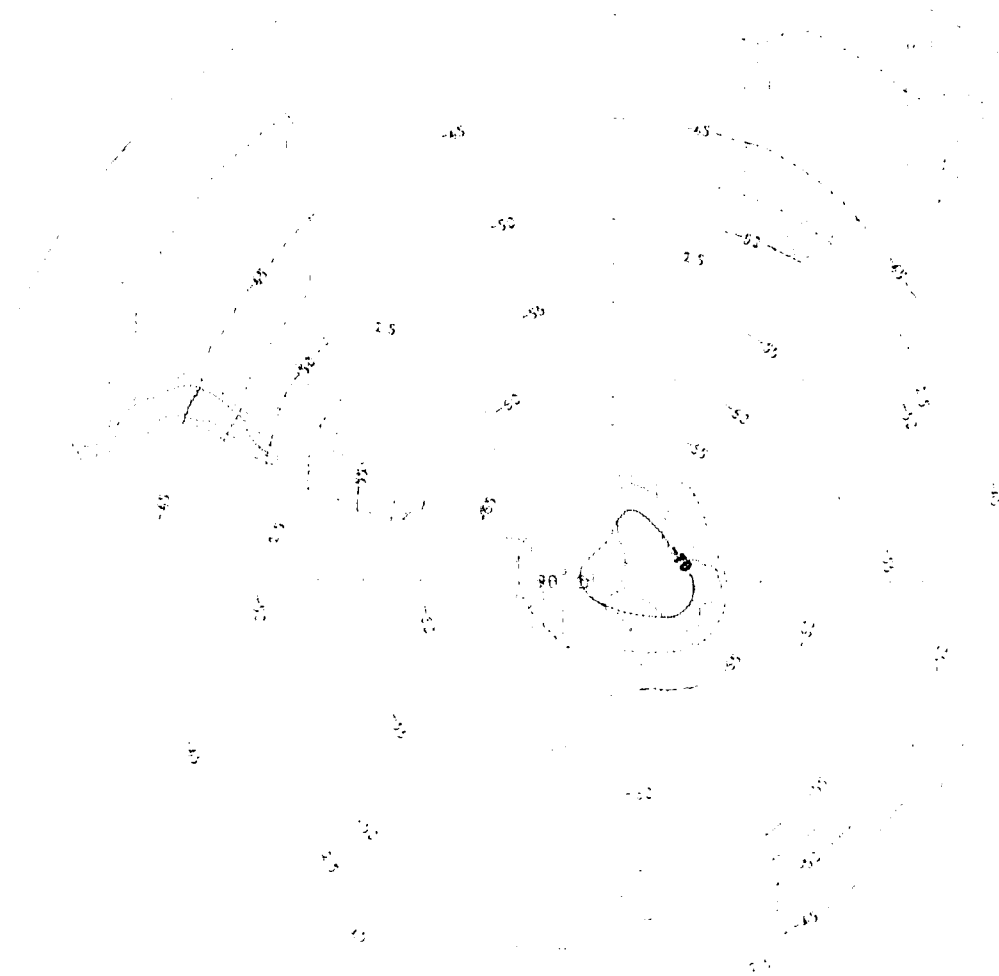
Mountain Ranges

Mean Temperature (°C)

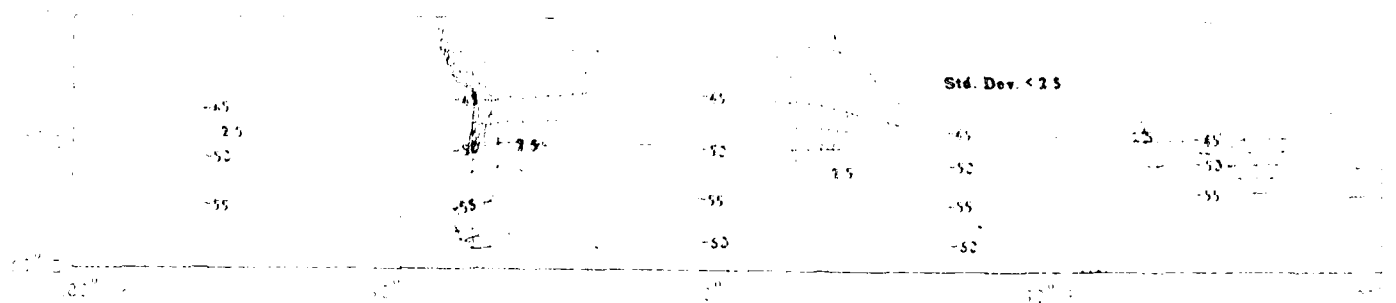
Jan. 1950-1959

1950

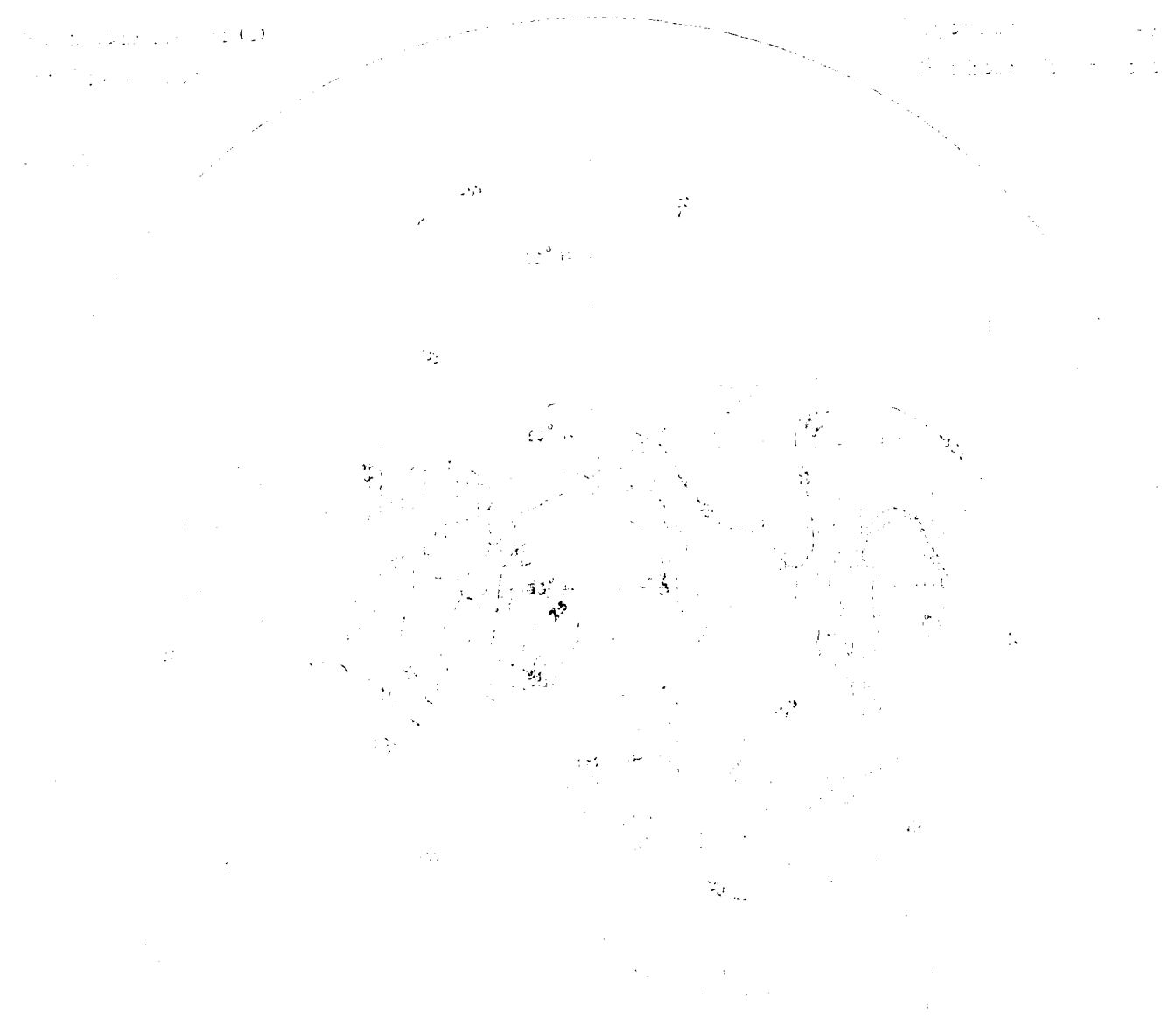
1951



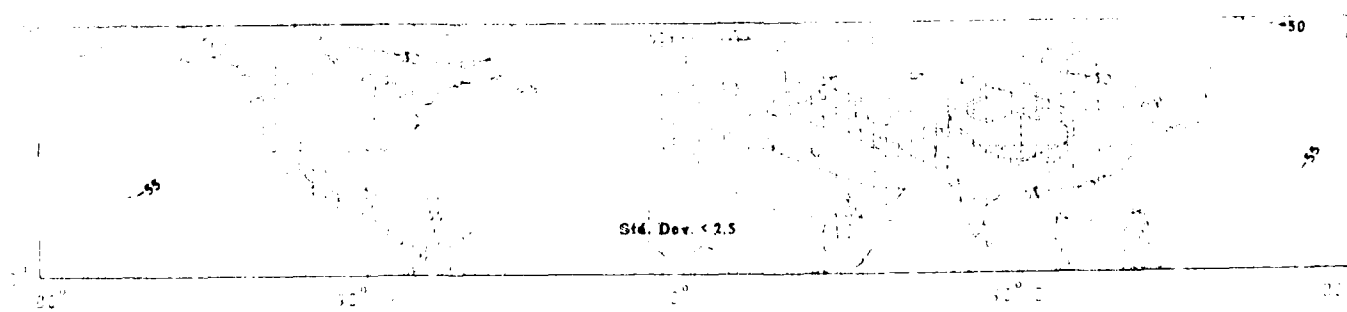
Std. Dev. < 2.5



Std. Dev. < 2.5



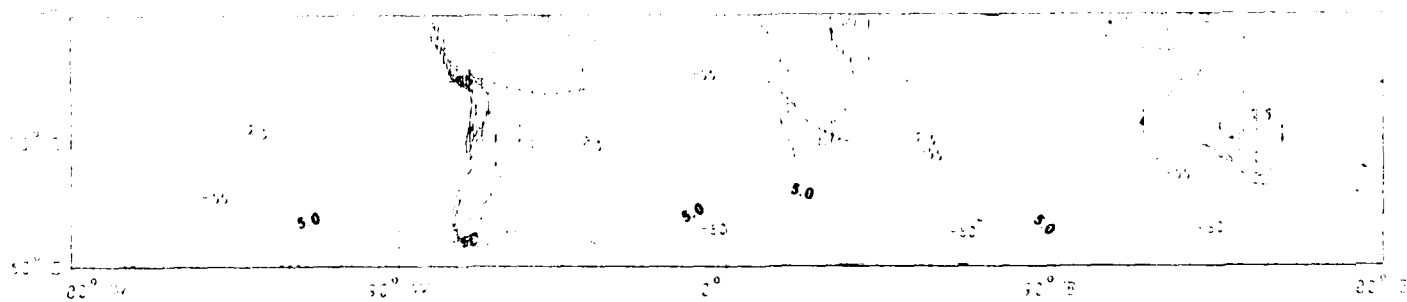
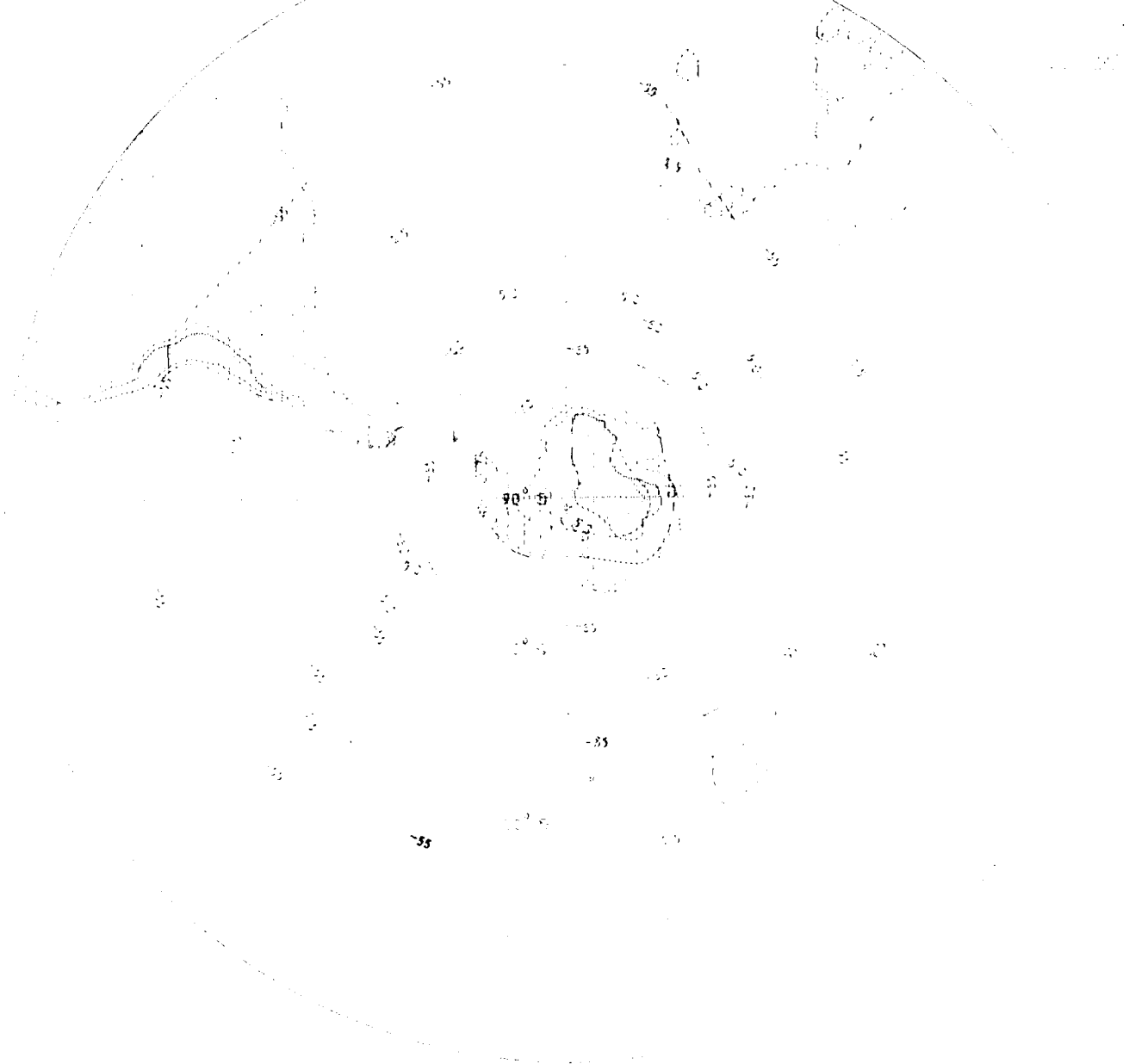
Std. Dev. < 1.5



Std. Dev. < 1.5

1. The first part of the map shows the distribution of the first group of islands, which are located in the northern part of the region.

2. The second part of the map shows the distribution of the second group of islands, which are located in the southern part of the region.



Mean Temperature (°C)

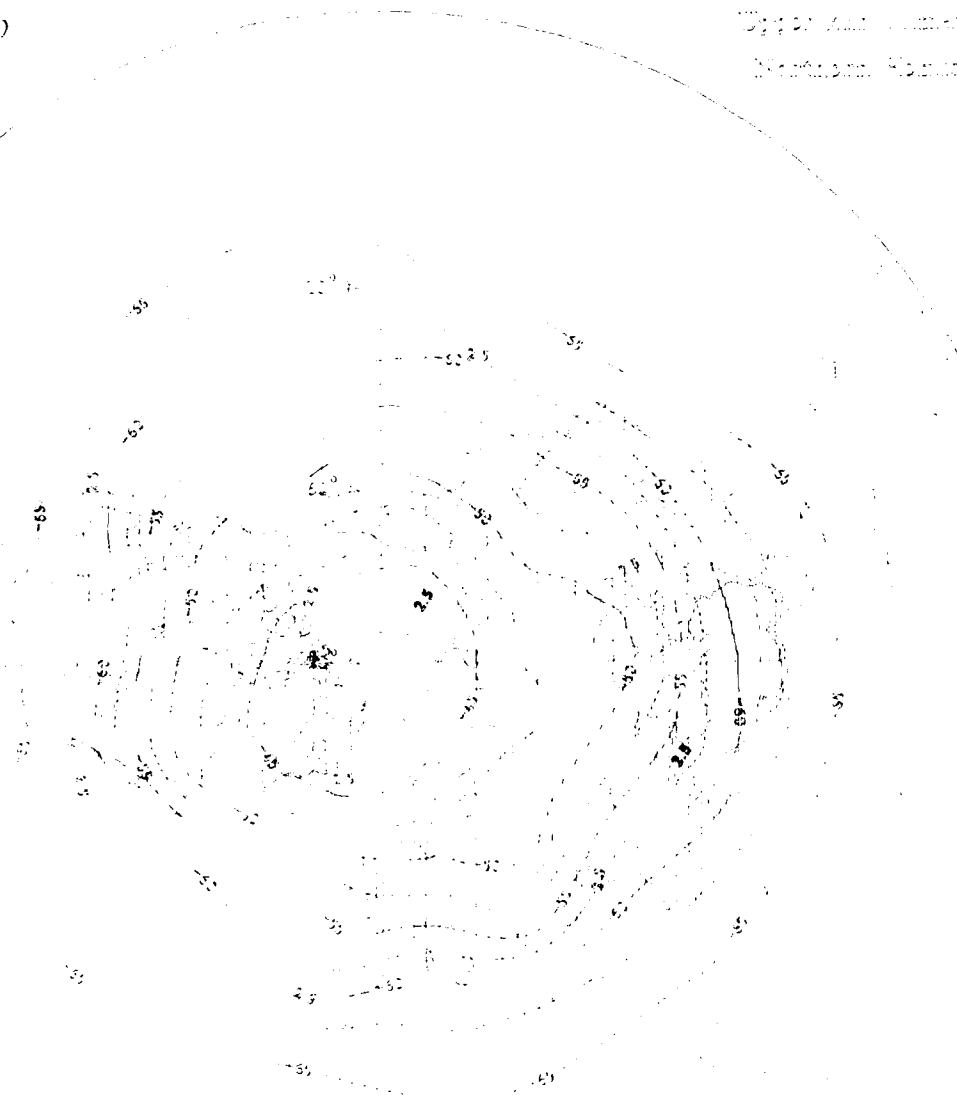
July 1961 - 1962

1961

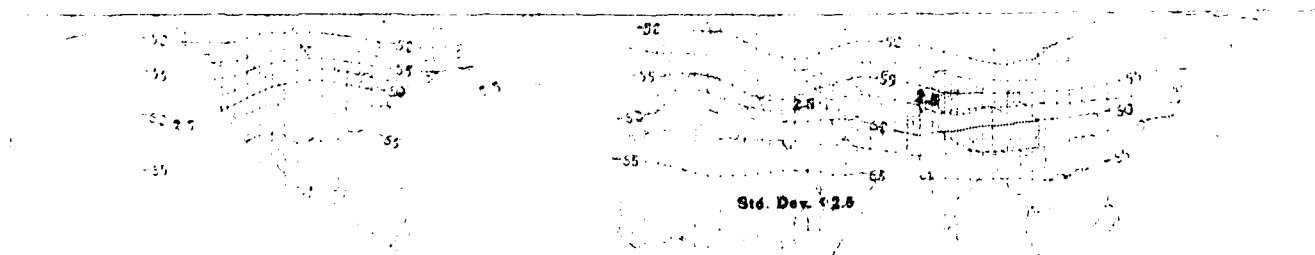
1962

Depth (m) 0-100

Standard Deviation



Std. Dev. < 2.5



Std. Dev. < 2.5

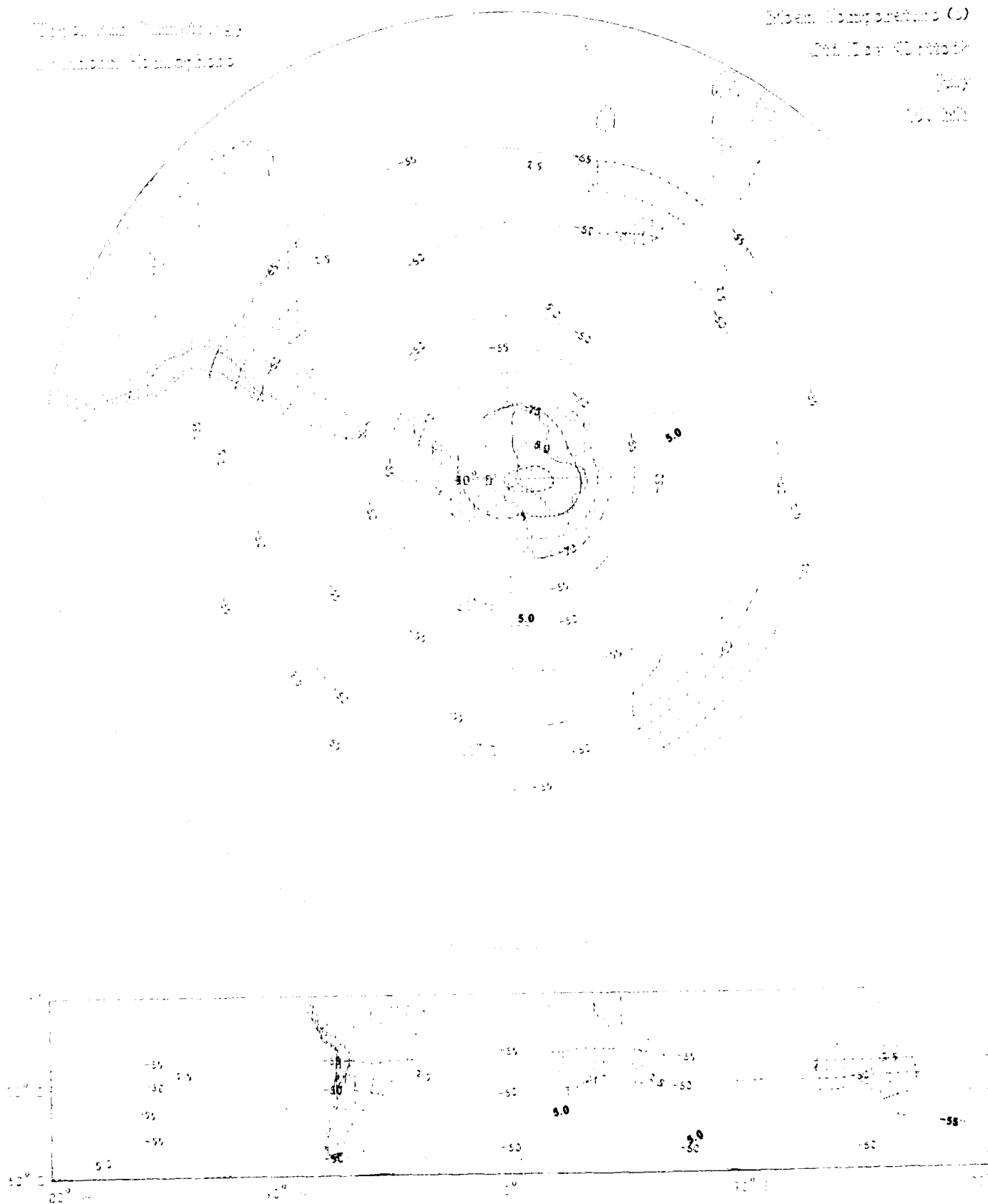
Typical and Unusual
 Atmospheric Phenomena

Mean Temperature (°C)

Mean Day Length (h)

July

1960



Mean Temperature (°C)

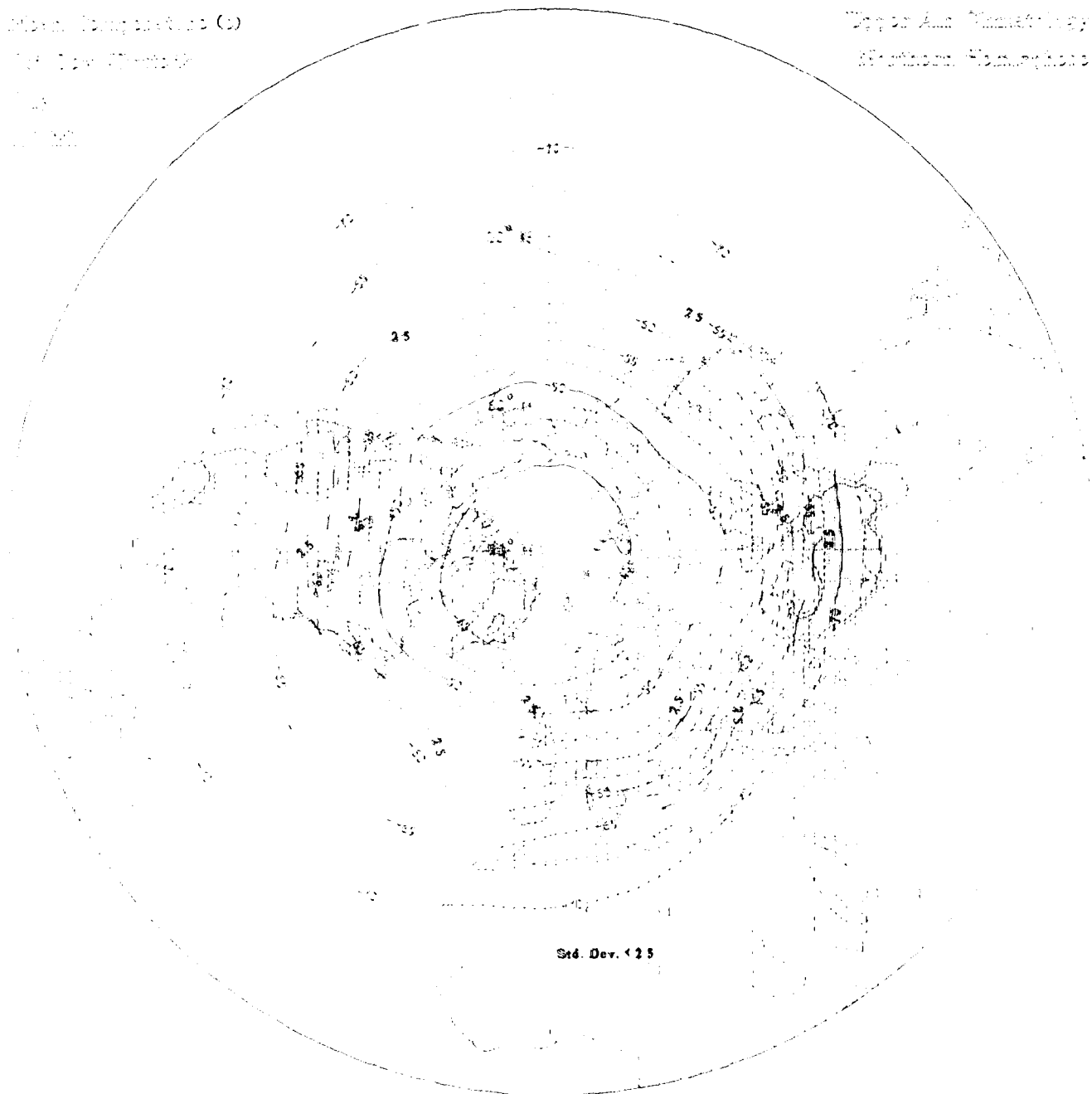
Sea Level Pressure (hPa)

Wind

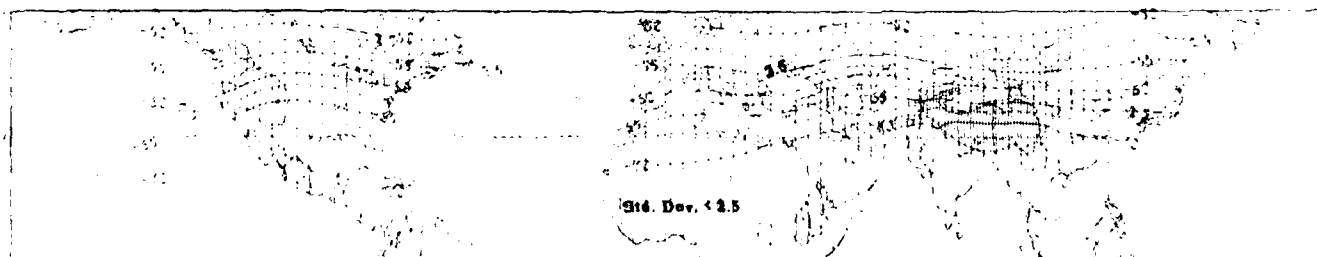
Clouds

Depth and Temperature

Atmospheric Humidity



Std. Dev. < 2.5



Std. Dev. < 2.5

0° 10° 20° 30° 40° 50° 60° 70° 80°

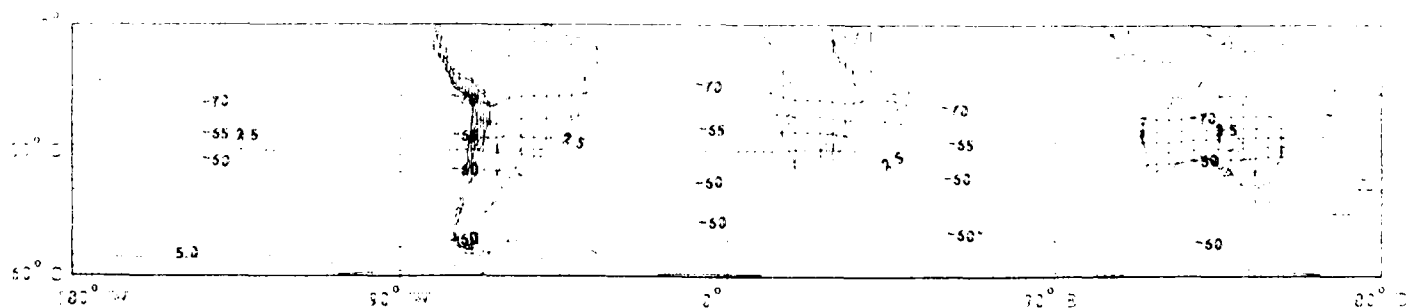
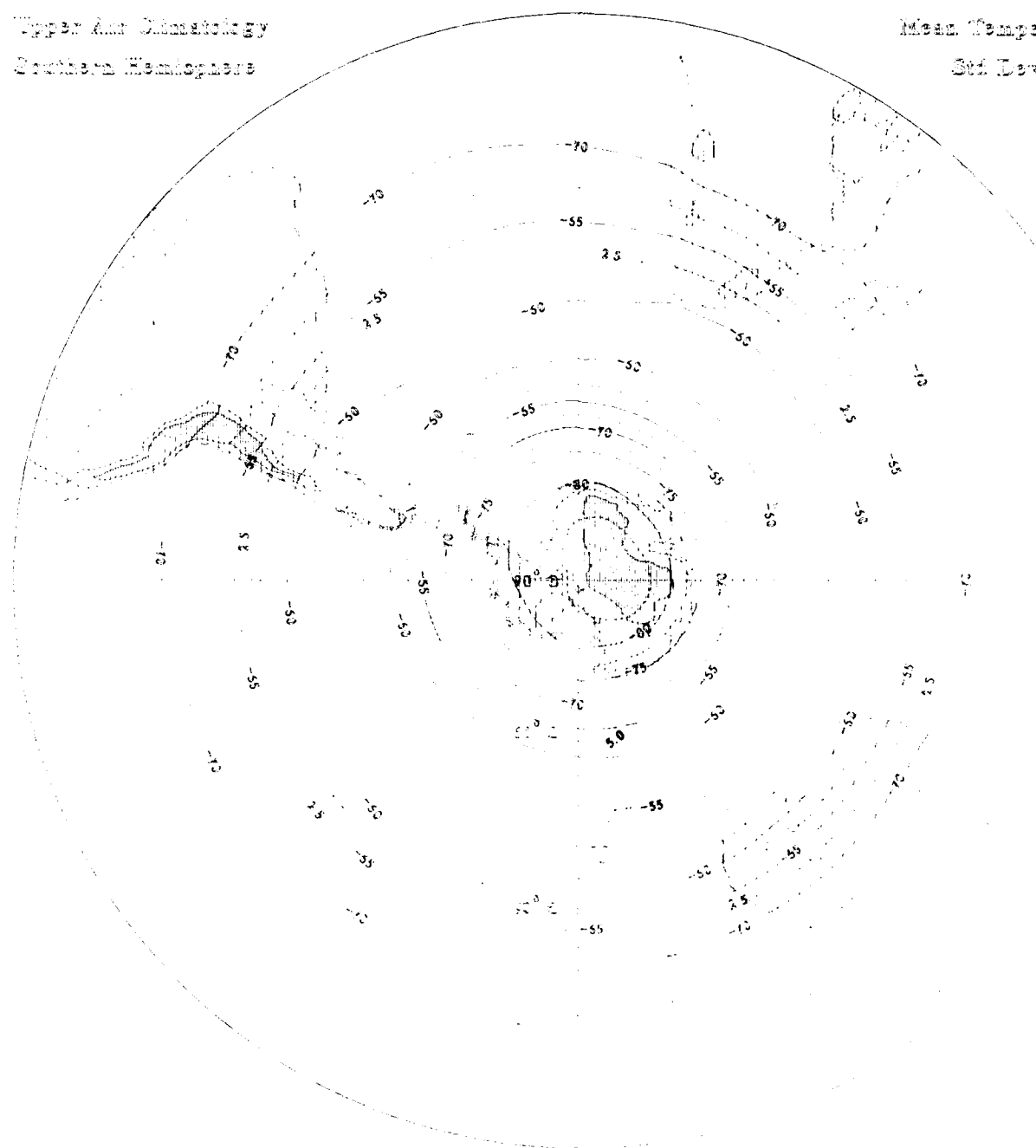
Upper Air Climatology
Southern Hemisphere

Mean Temperature (°C)

Std Dev (°C)

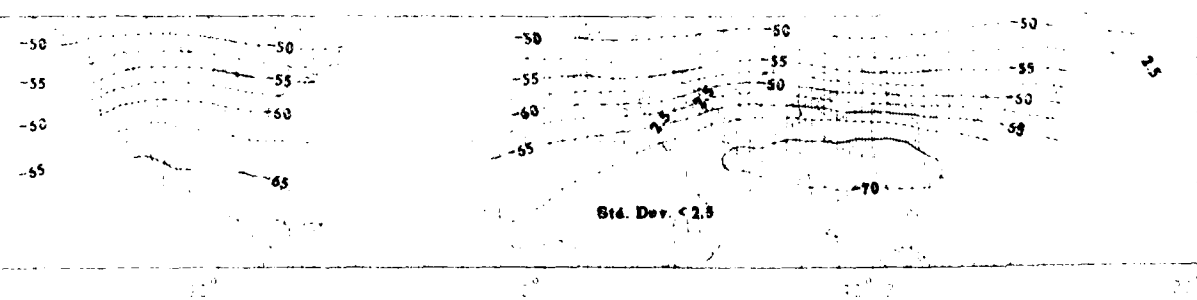
July

1950-59



70 MS

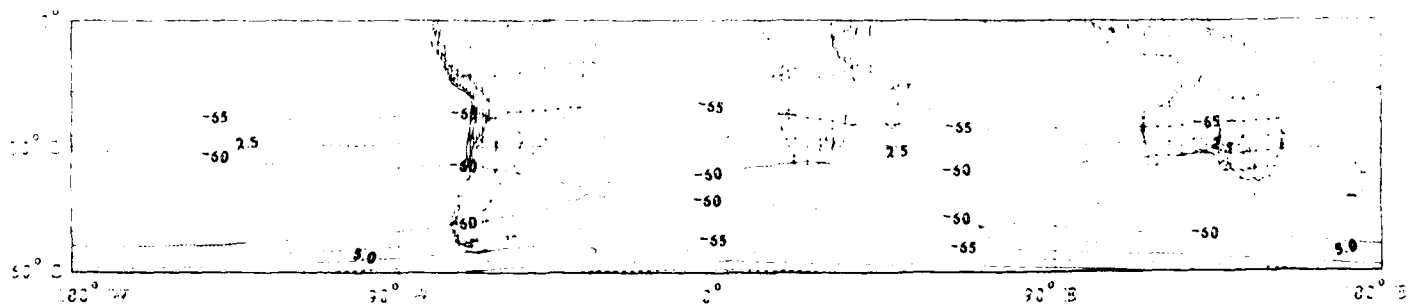
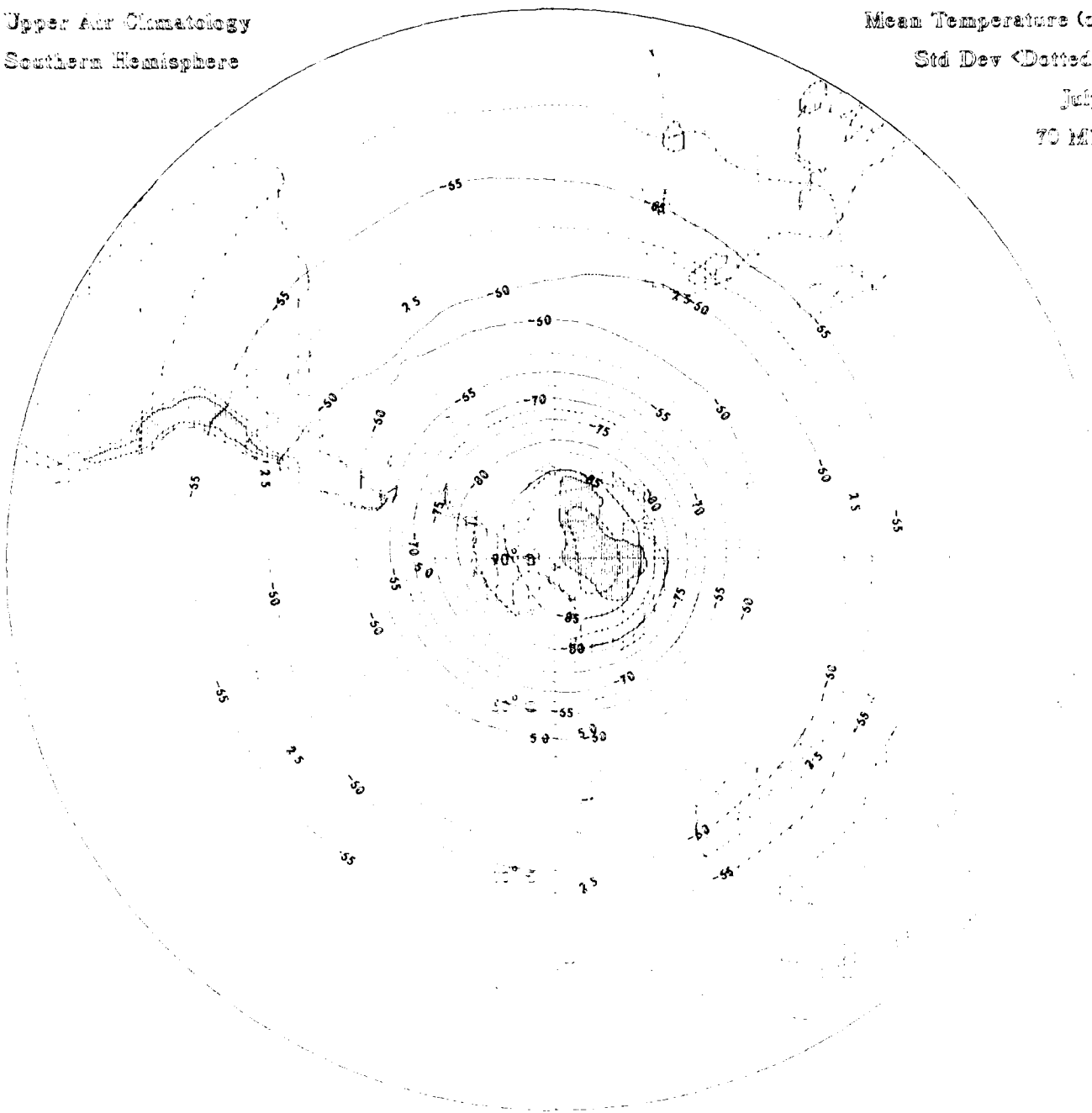
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Temperature (c)
Std Dev (Dotted)

July
70 MB



Mean Temperature (c)

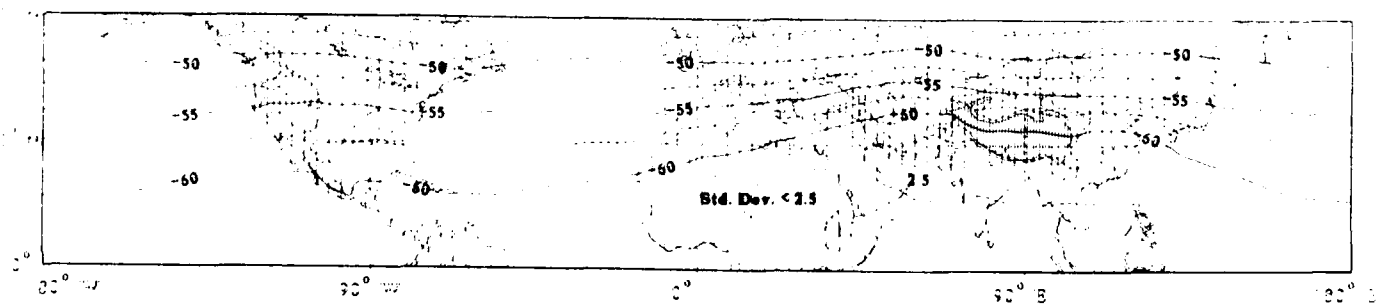
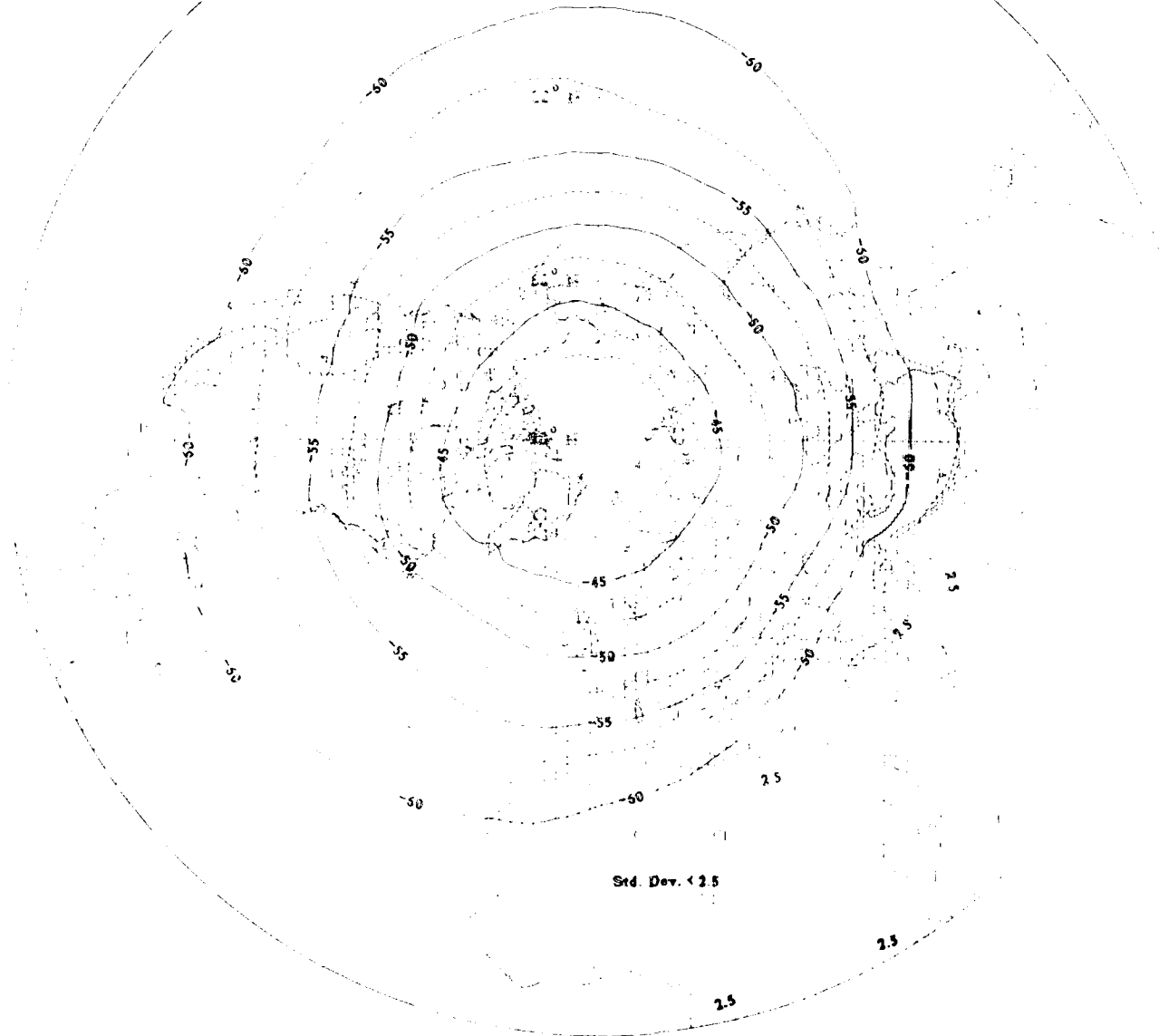
Std. Dev. <Dotted>

July

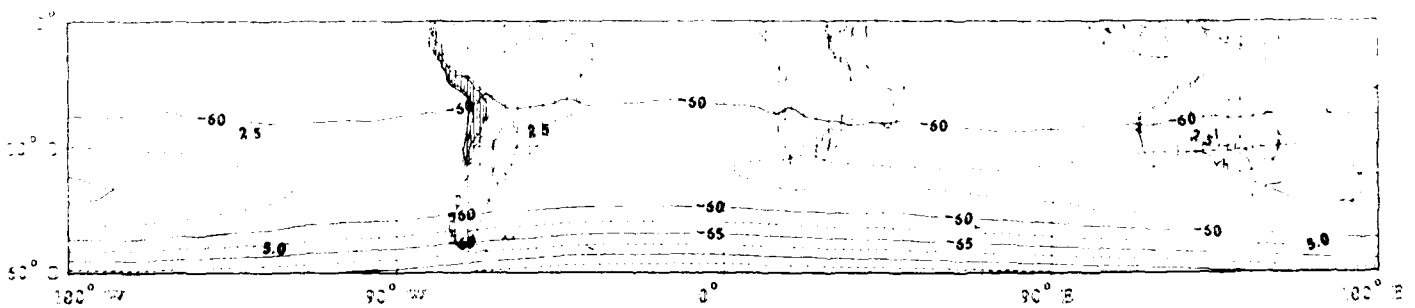
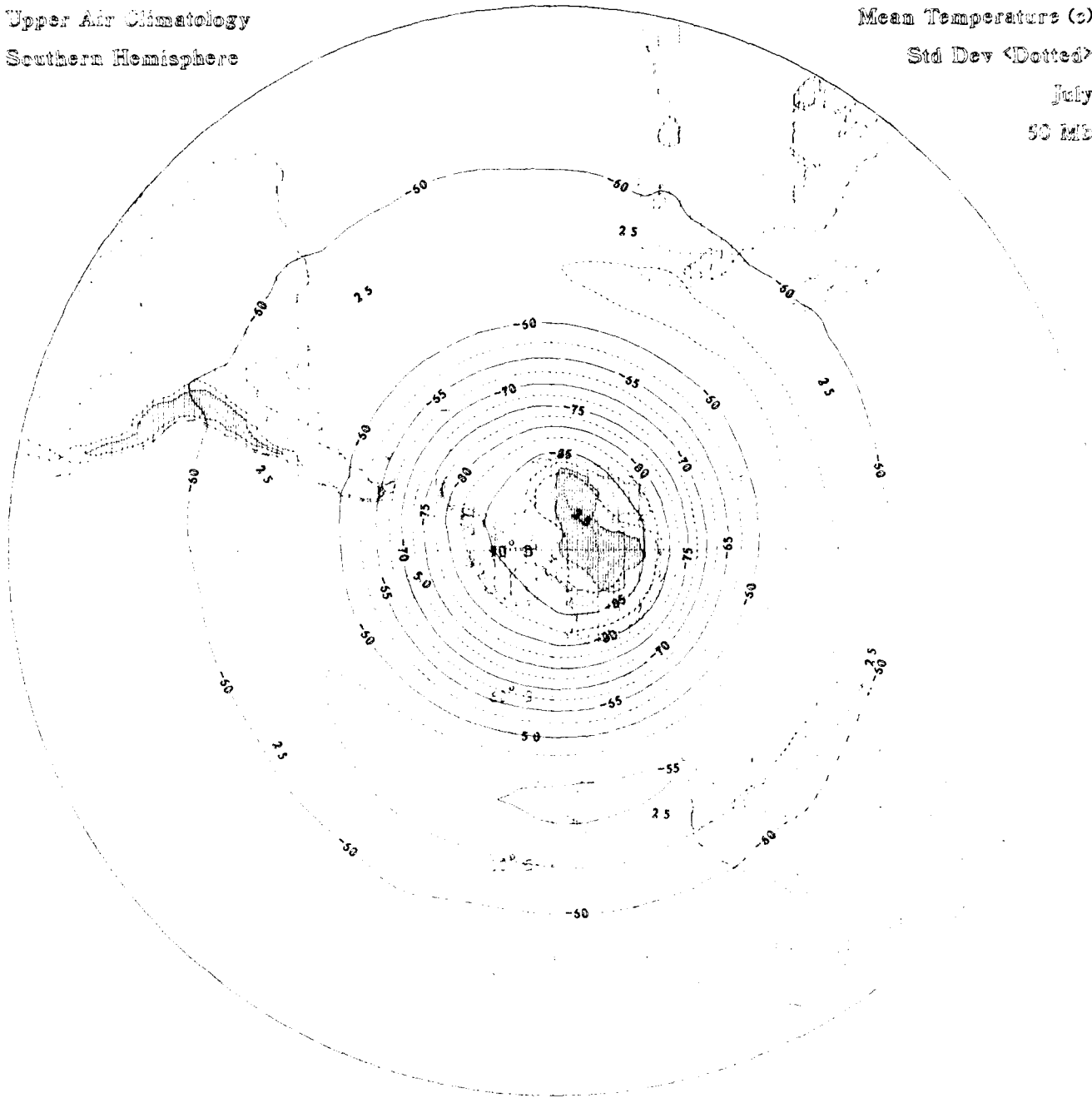
50 MB

Upper Air Climatology

Northern Hemisphere



Mean Temperature (°)
Std Dev (Dotted)
July
50 MB



Mean Temperature (°C)

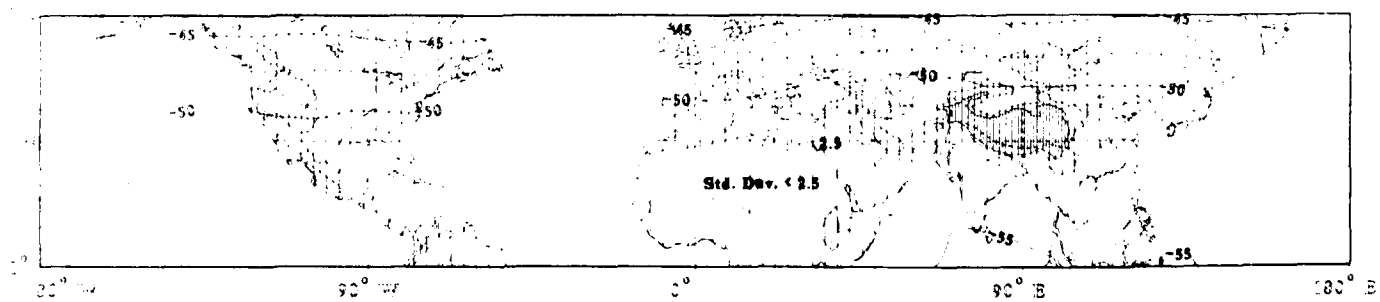
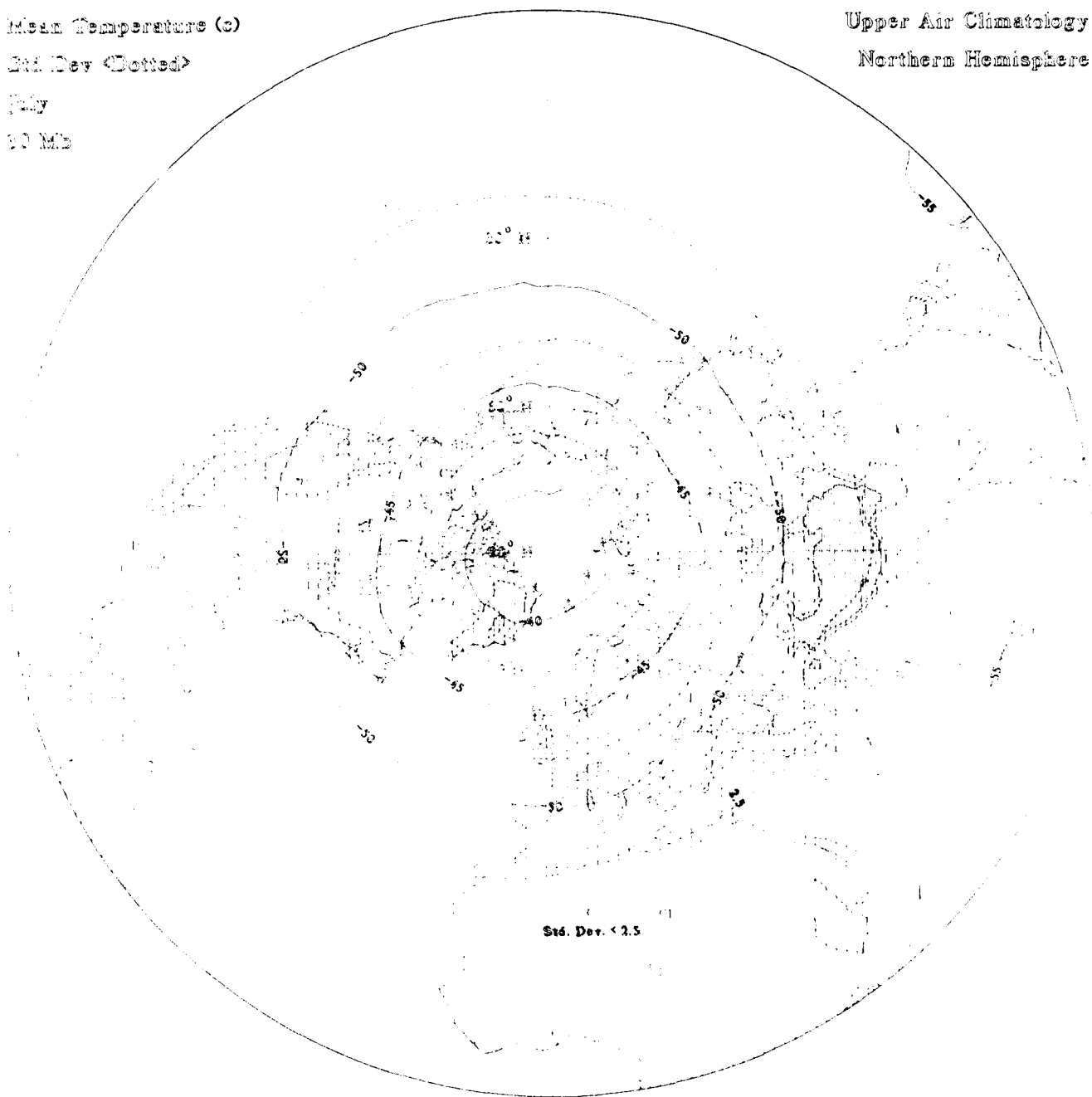
Std. Dev. (Dotted)

July

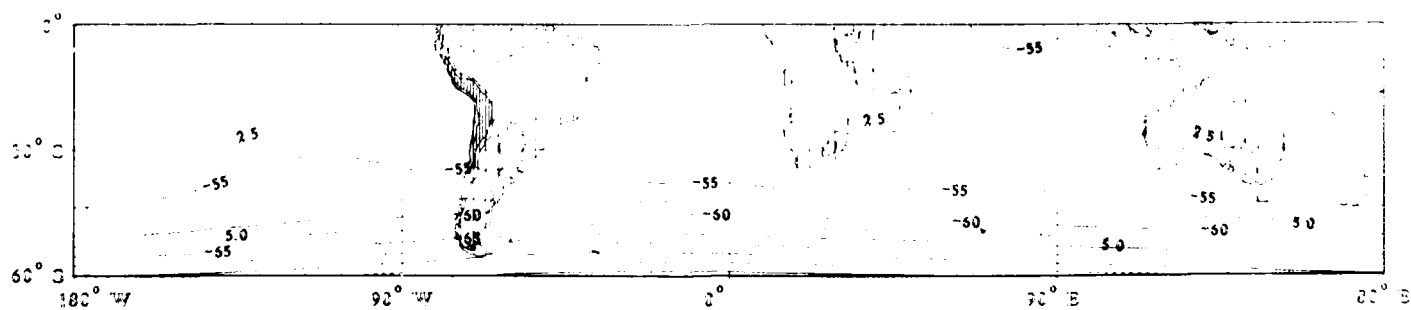
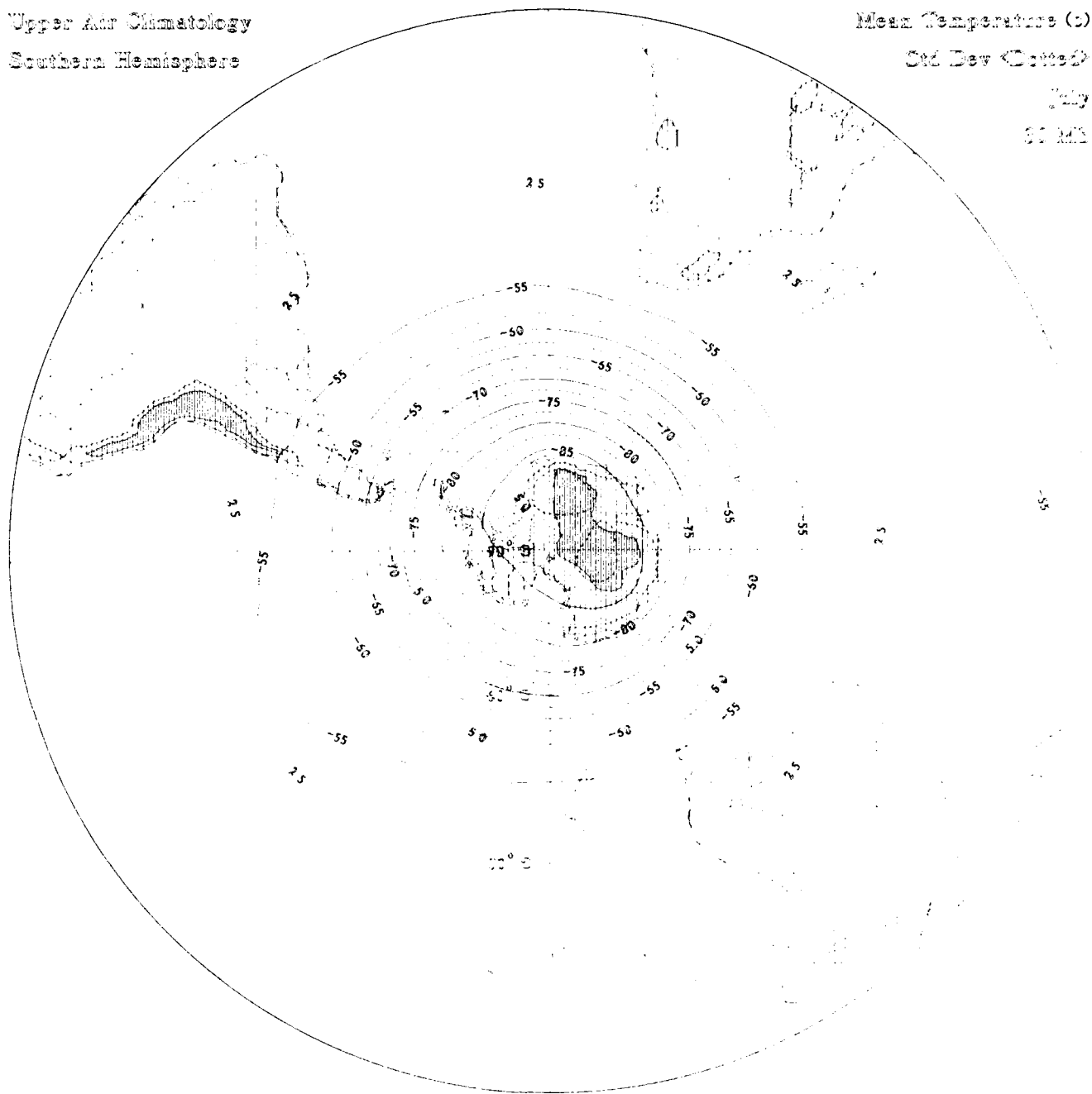
50 Mb

Upper Air Climatology

Northern Hemisphere



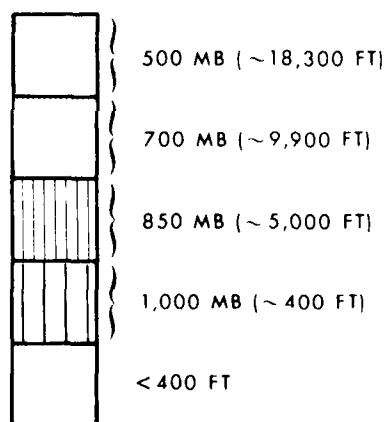
60 MN



DEW POINT
(6 LEVELS, 1000 TO 300 MB)

- Contours of mean dew point (solid and dashed lines) in °C; solids labeled, dashed intermediates unlabeled.
- Dew point labeled interval: 5°C
- Contours of standard deviation of dew point (dotted lines) in °C
- Standard deviation of dew point labeled interval: 2.5°C
- Contours blanked for geographic area with elevations exceeding specified geopotential heights

ELEVATION SCALE



Mean Low Point (c)

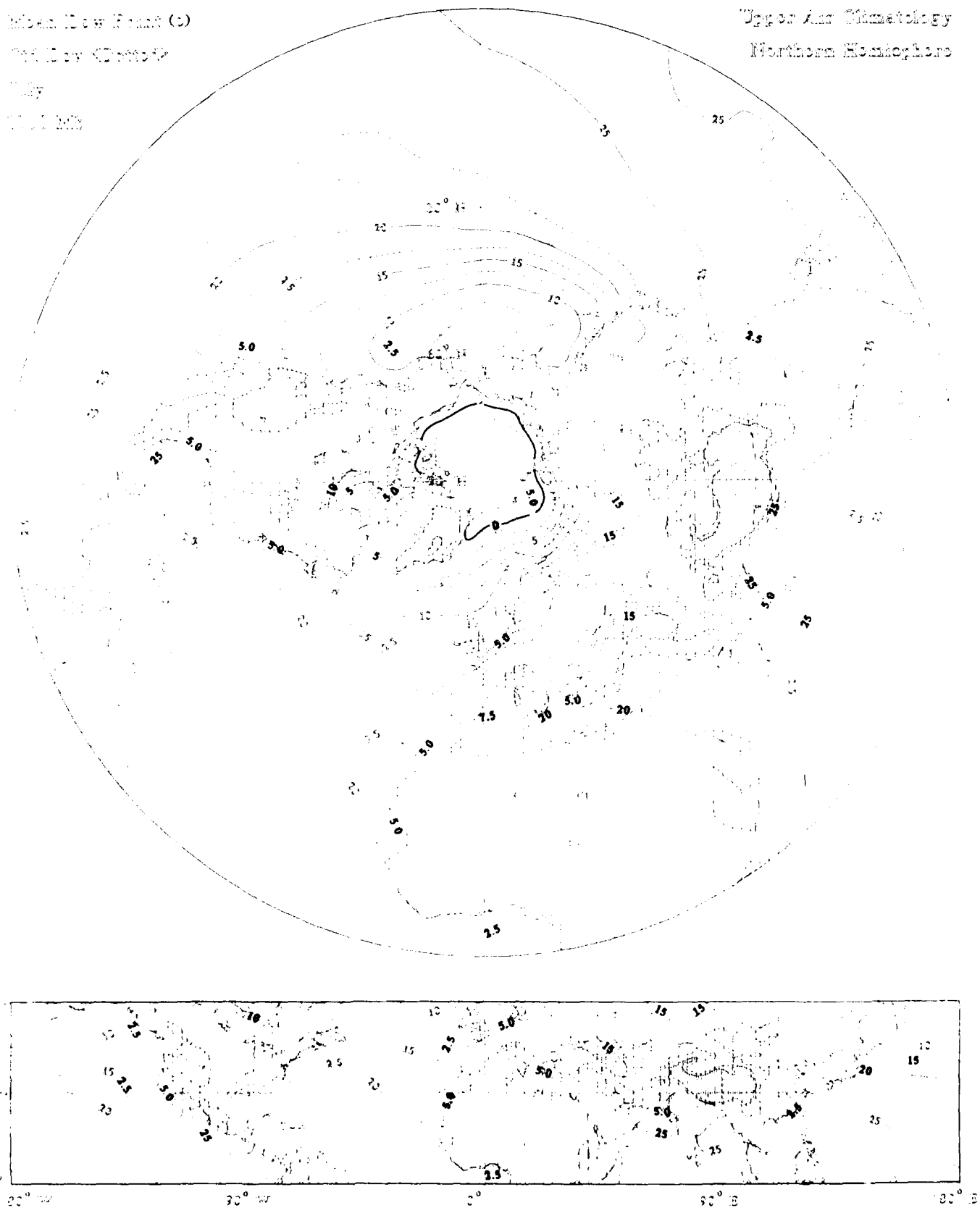
Sea Level (Dotted)

1000

1000

Upper Air Climatology

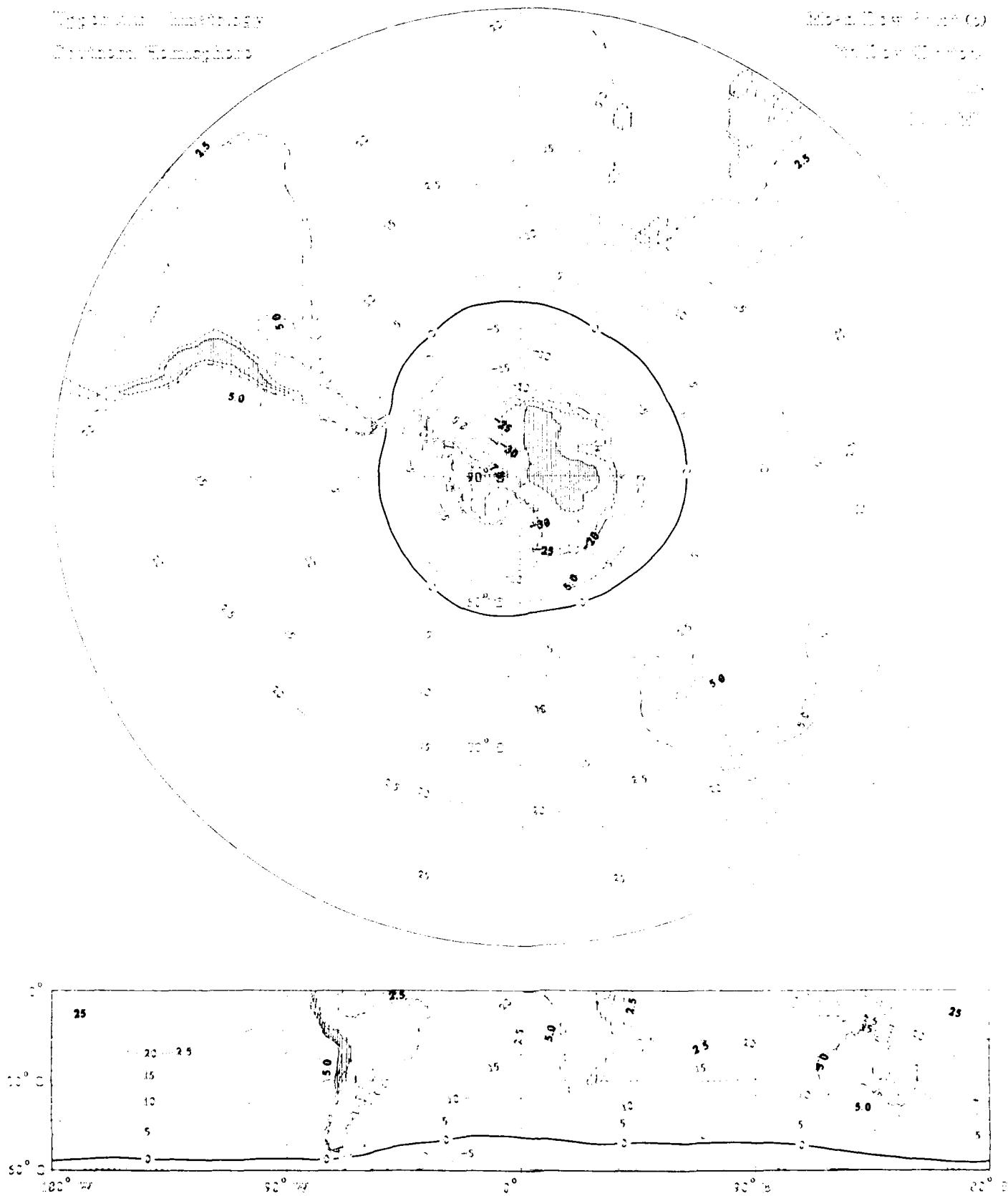
Northern Hemisphere



Topographic Contouring
 Division, Washington

Map of New York (2)

Scale 1:100,000



Mean Flow Rate (C)

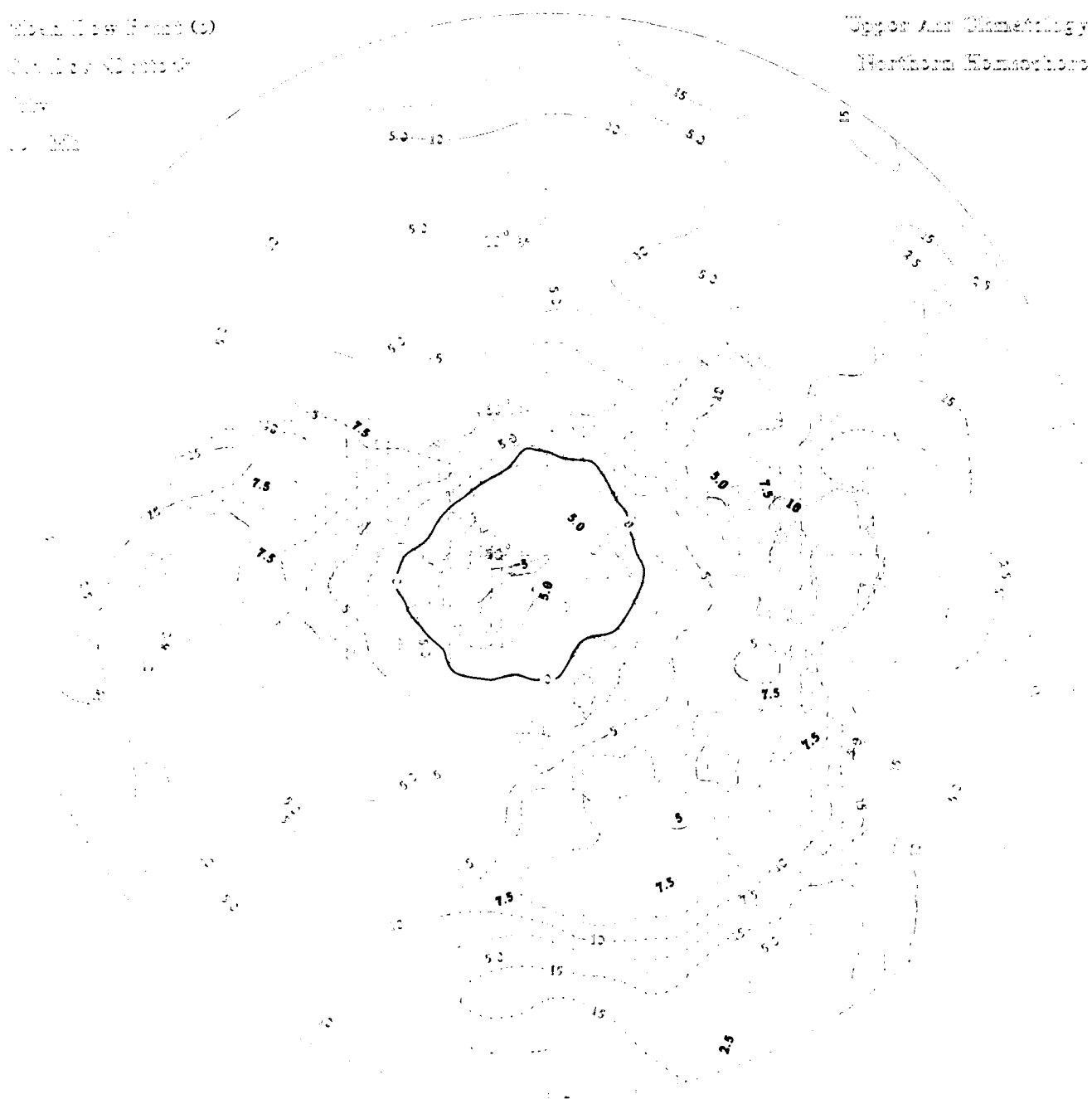
Surface Climatology

Temp

1000

Upper Air Climatology

Northern Hemisphere

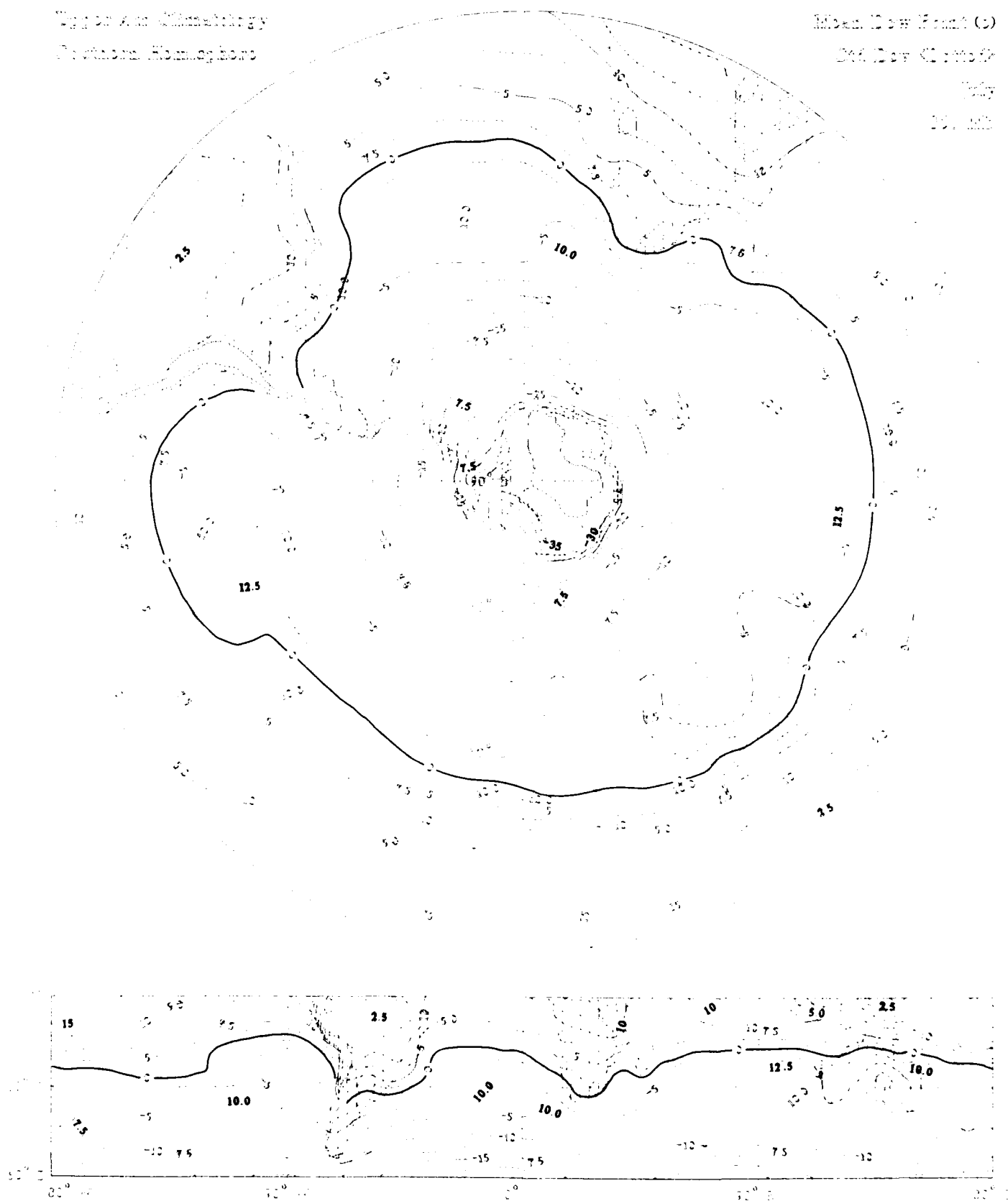


Types and Climatology
 Preterrestrial Homophones

Mean Low Point (C)

Sea Level Climate

July
 1970



Model Low Front (c)

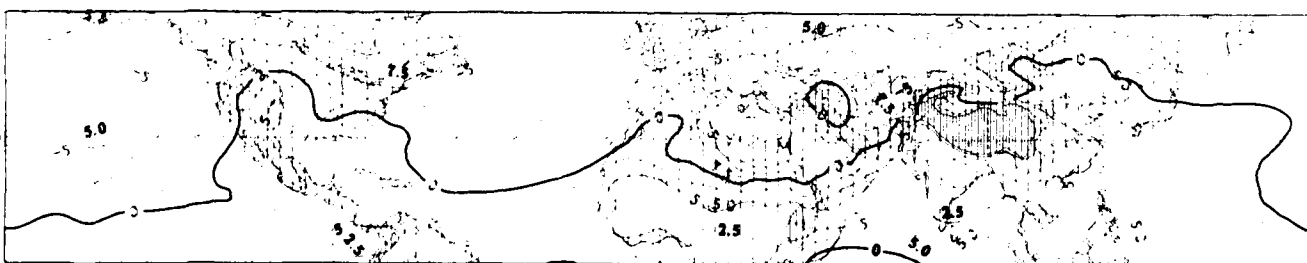
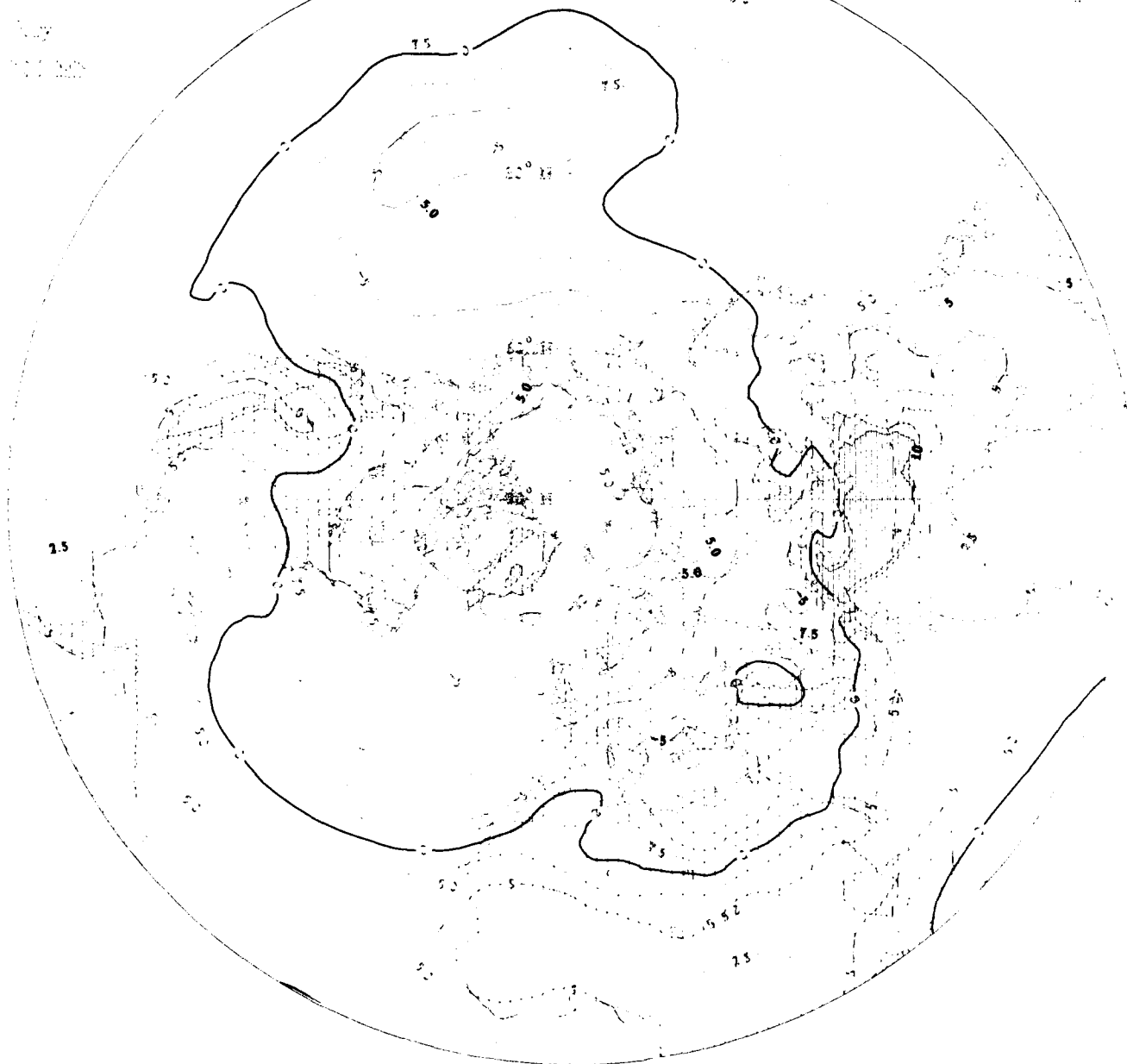
Sea Level Contours

July

1955

Upper Air Temperature

Warshaw Homograph



MS-4 (New Point (2))

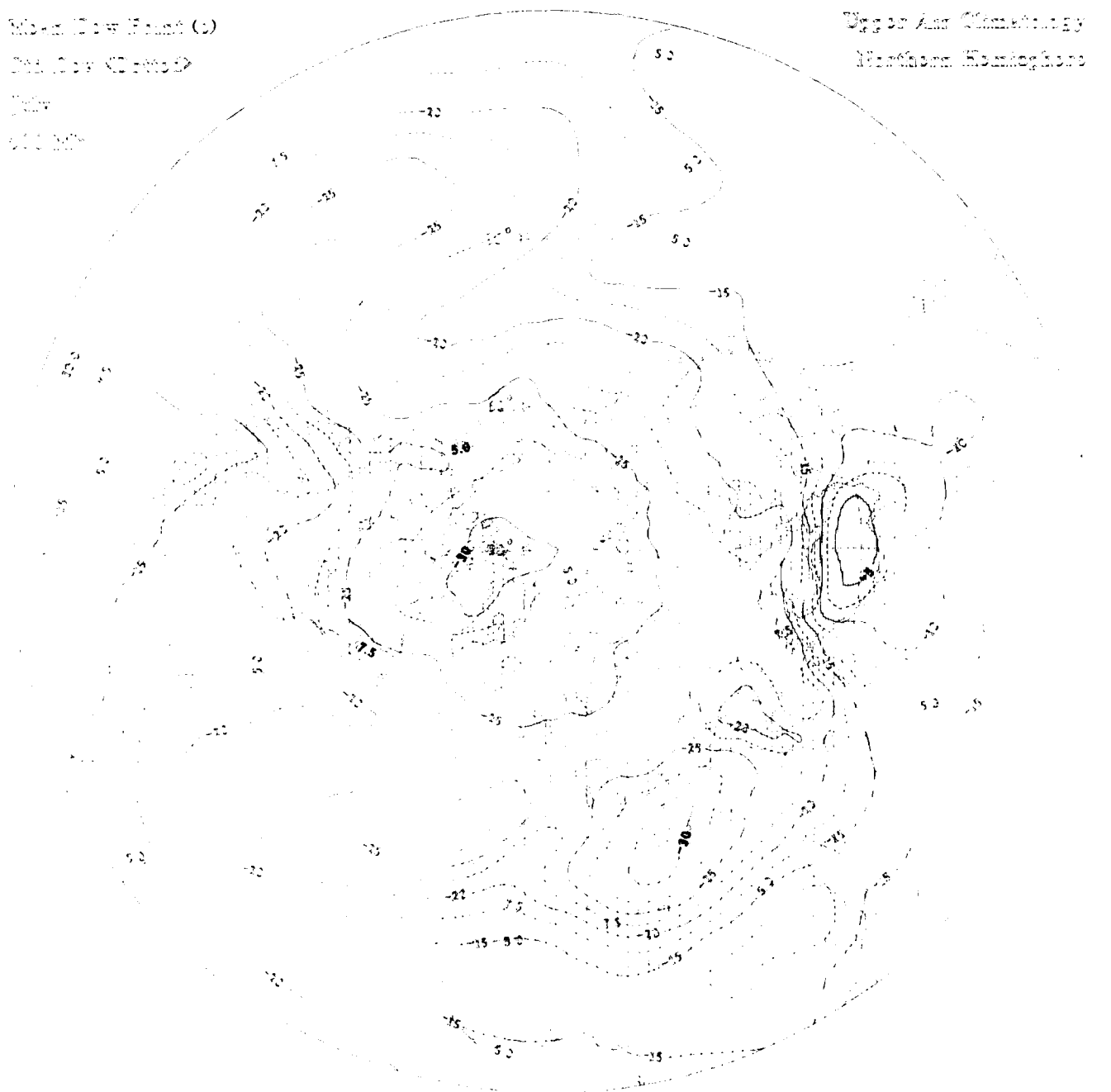
MS-4 (New Point (2))

MS-4

MS-4

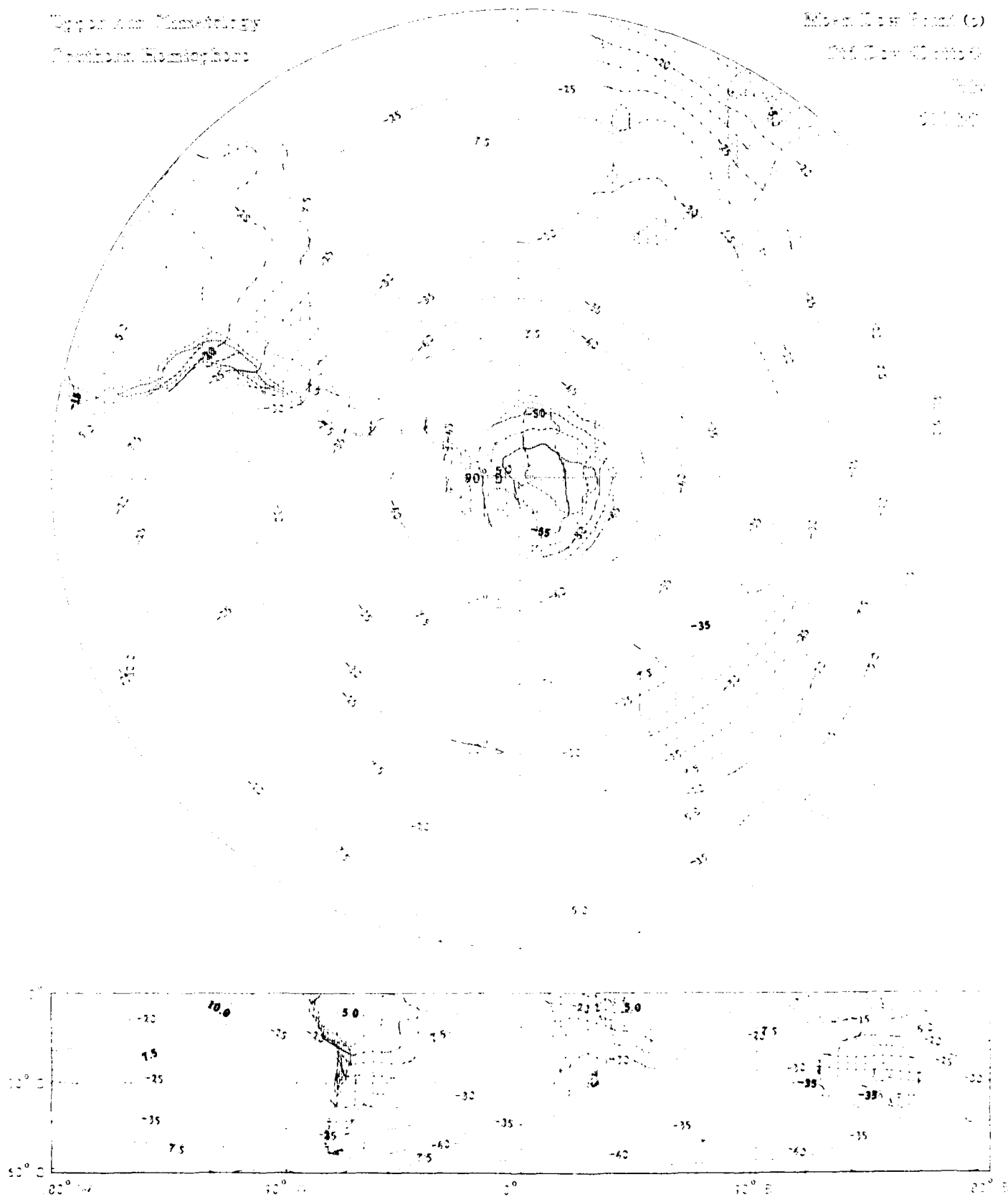
MS-4 (New Point (2))

MS-4 (New Point (2))



Upper Air Massatology
 Southern Hemisphere

Mid-level Low (m) (°)
 Sea Level (m) (°)
 1000
 500



Mean Dew Point (°C)

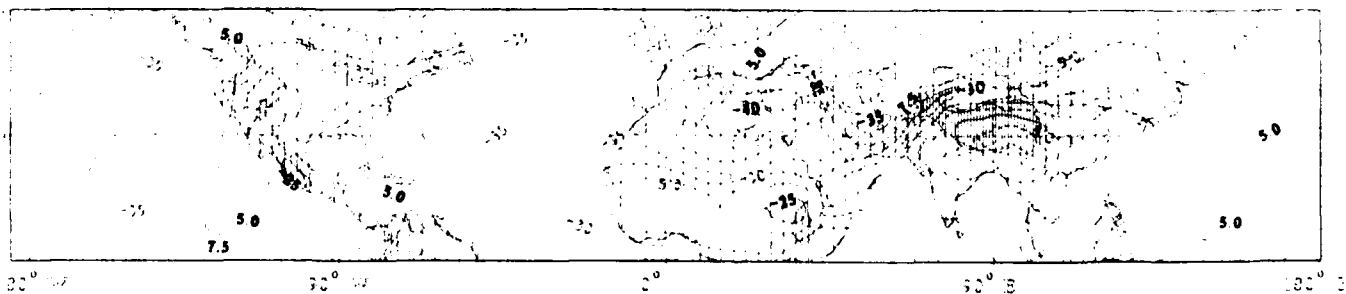
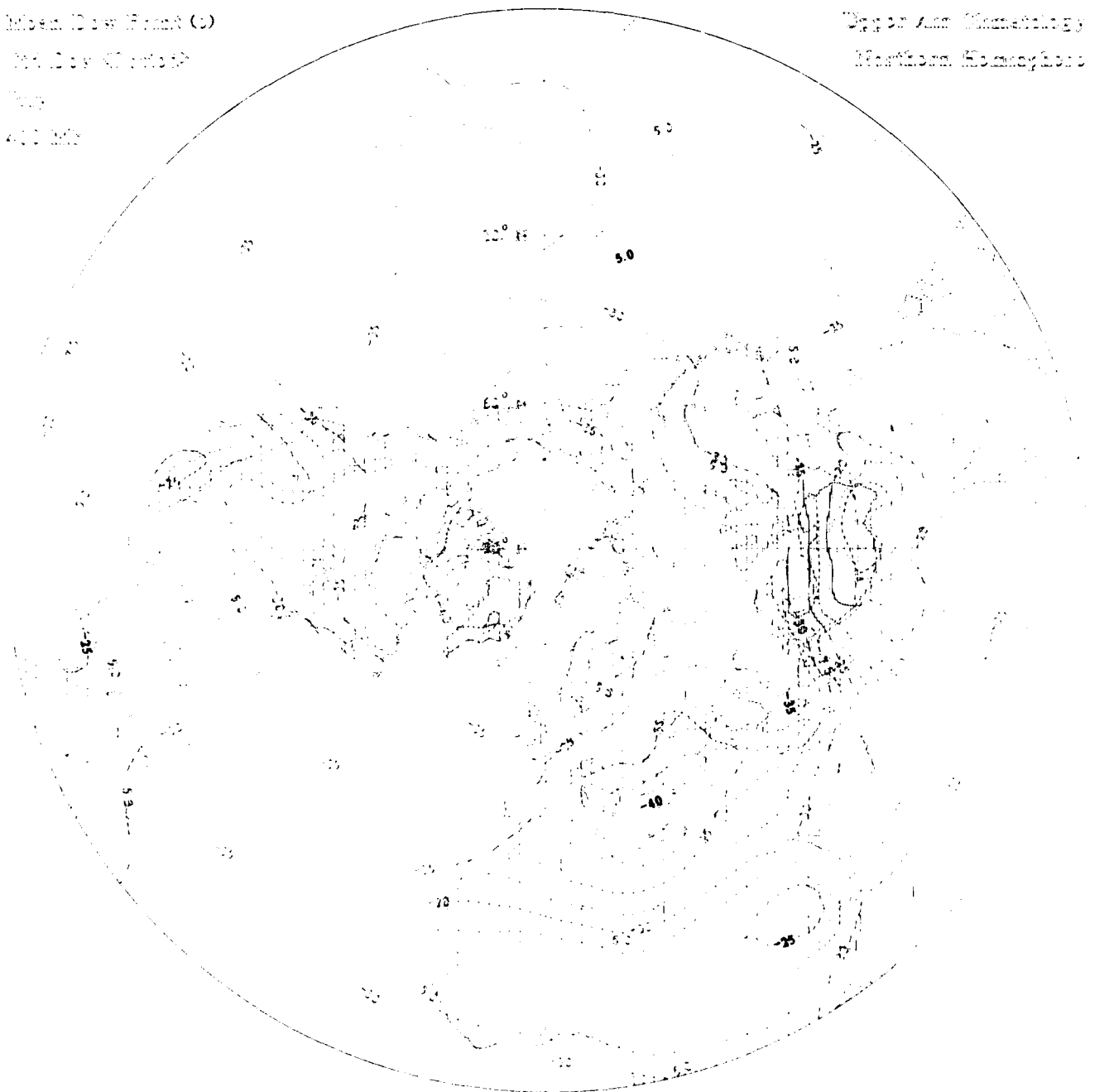
Mid-July Climate

1949

400 mb

Upper Air Climatology

Northern Hemisphere



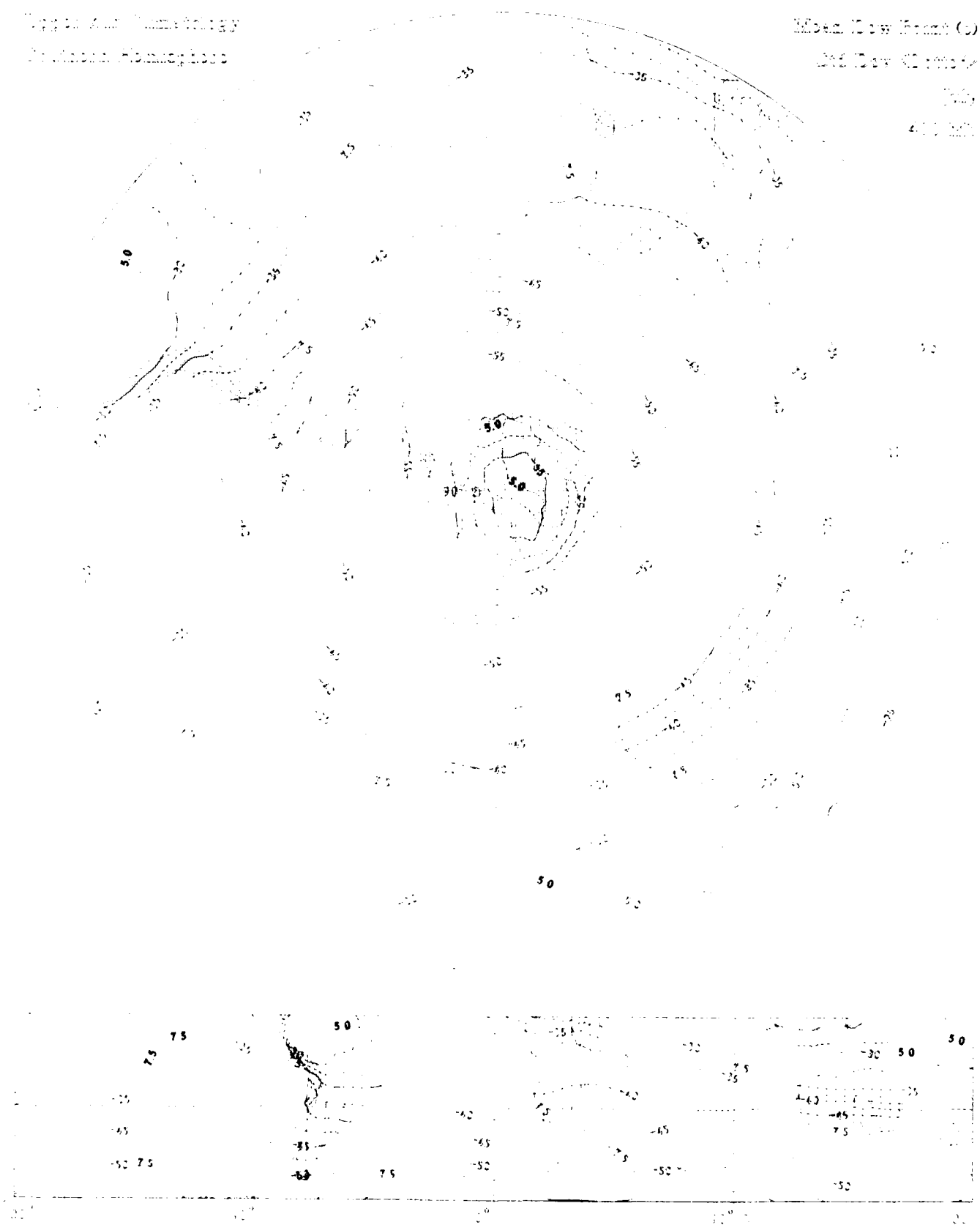
Upper Air Climatology
 Southern Hemisphere

Mean Low Point (c)

Mid Day Climate

700

400 mb



Mean Low Flood (c)

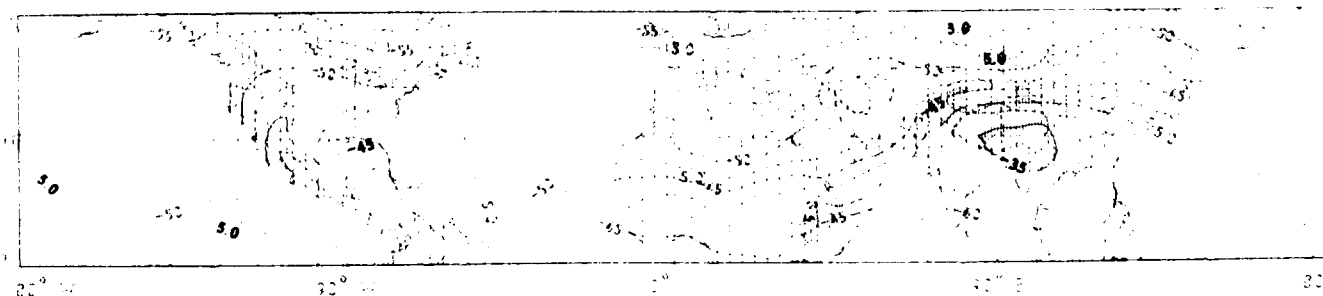
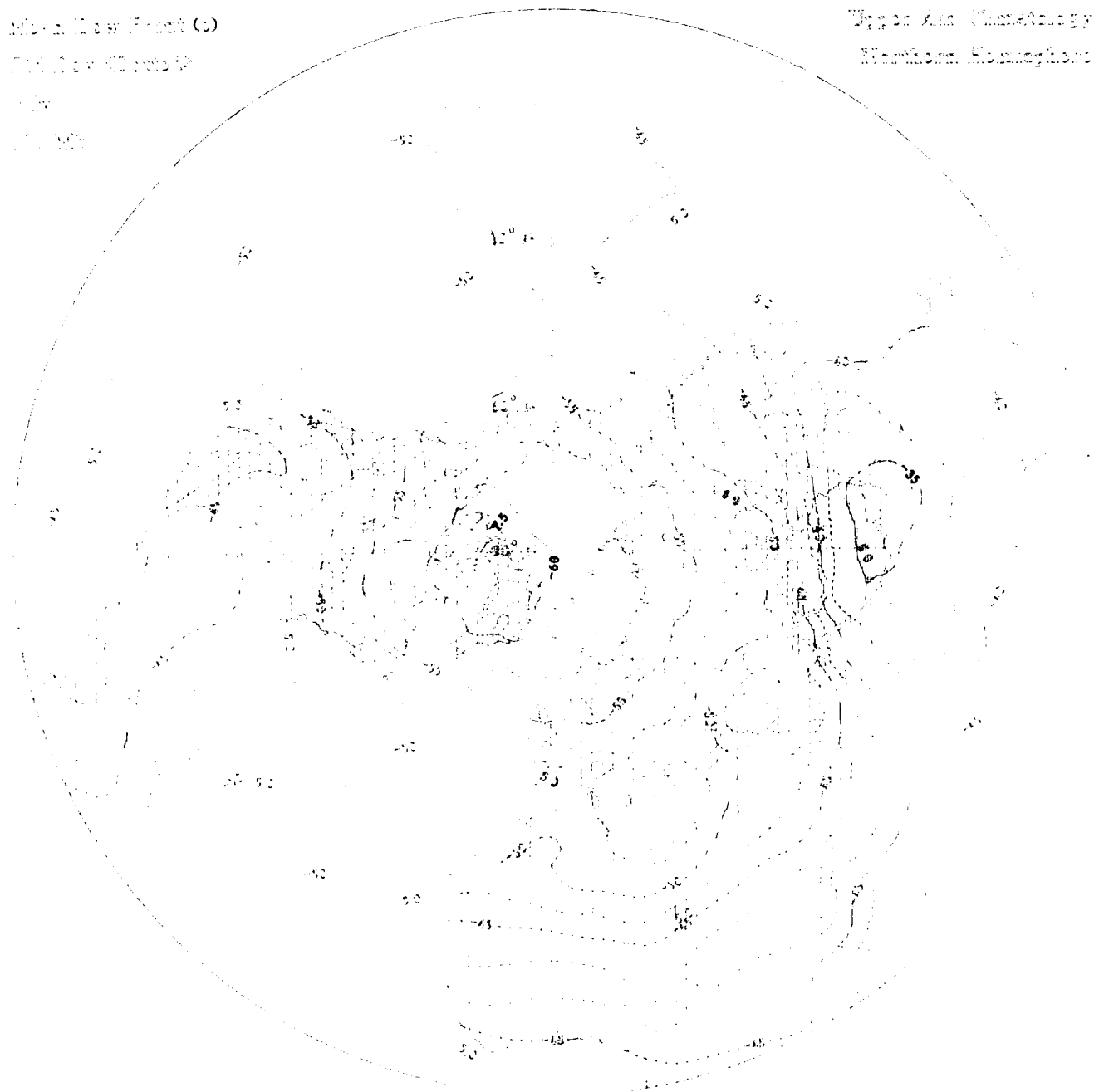
Sea Level 0.0000

100

1000

Upper Air Climatology

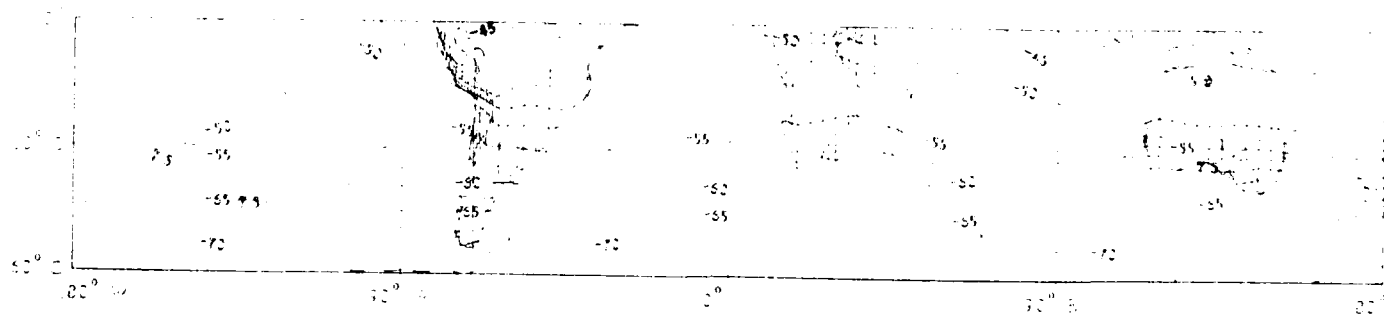
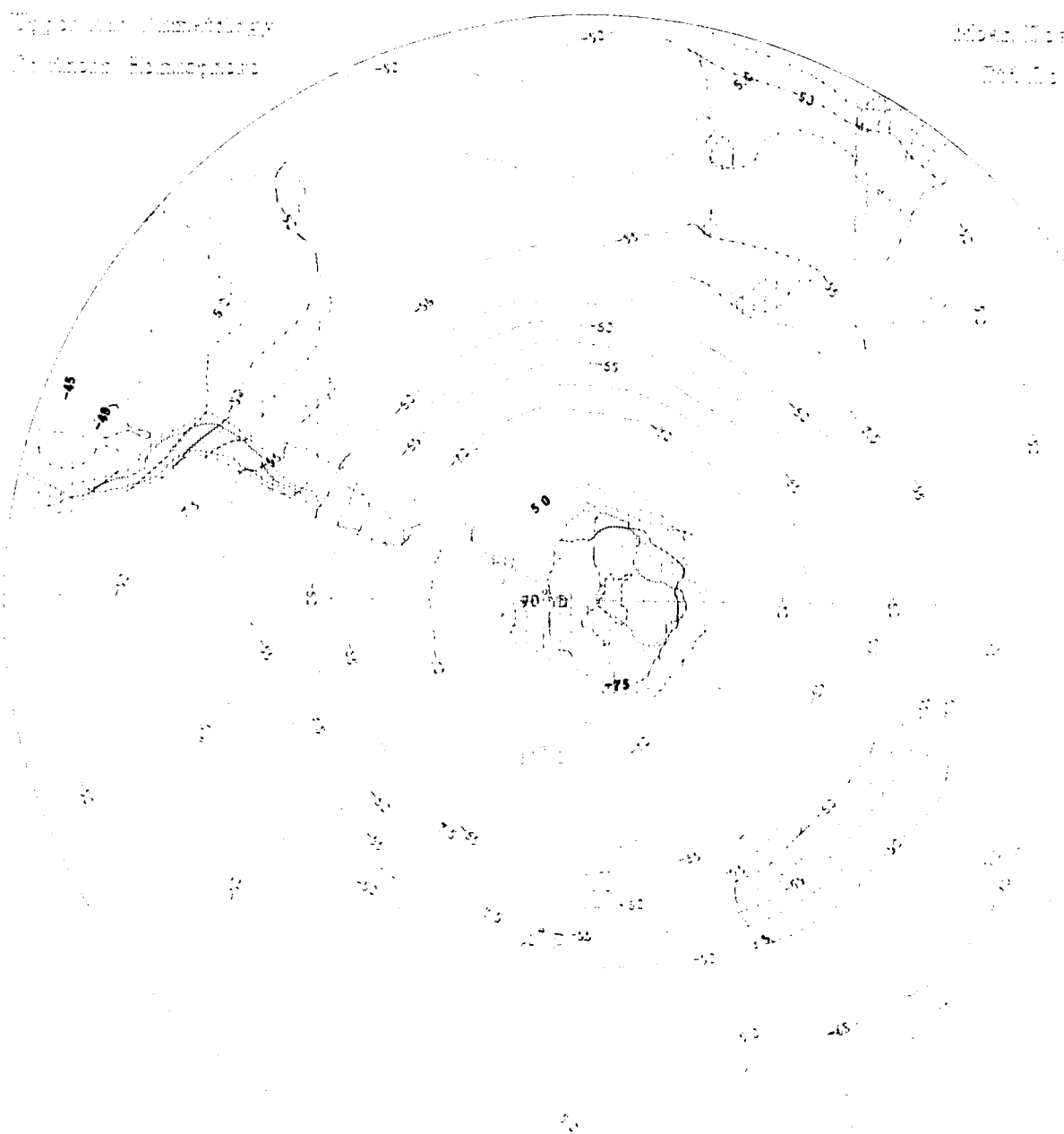
Northern Hemisphere



Topographic Contouring
of the Hawaiian Islands

Mean Sea Level (1)

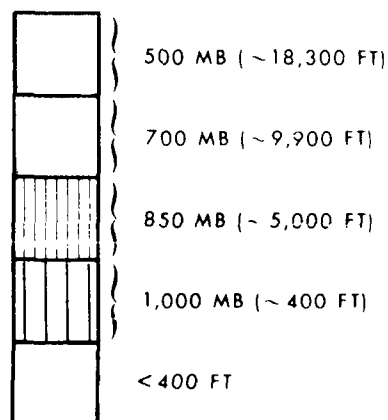
Sea Level (2)



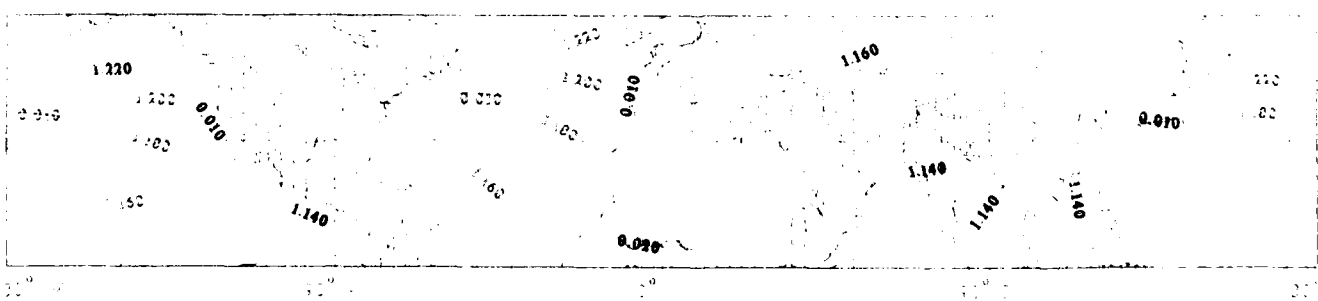
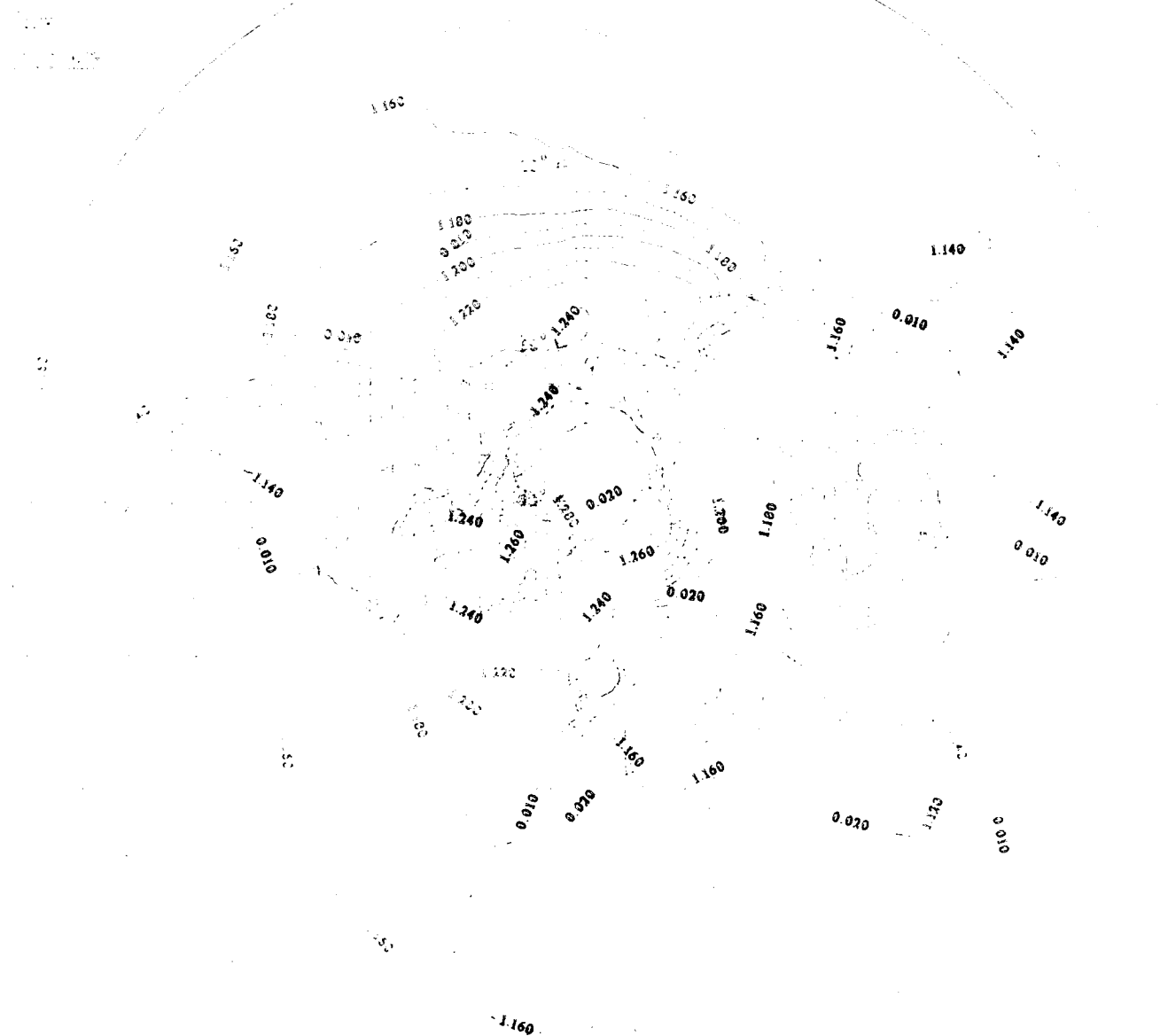
DENSITY
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean density (solid and dashed lines) in kilograms/cubic meter:
solids labeled, dashed intermediates unlabeled
- Density labeled interval:
 - .02 kilograms/cubic meter - 1000 MB to 400 MB
 - .01 kilograms/cubic meter - 300 MB to 200 MB
 - .006 kilograms/cubic meter - 150 MB to 30 MB
- Contours of standard deviation of density (dotted lines) in kilograms/cubic meter
- Standard deviation of density labeled interval:
 - .01 kilograms/cubic meter - 1000 MB to 400 MB
 - .005 kilograms/cubic meter - 300 MB to 200 MB
 - .003 kilograms/cubic meter - 150 MB to 30 MB
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



| Trial | Control (n = 10) | MCI (n = 10) | AD (n = 10) |
|-------|------------------|--------------|-------------|
| 1 | 85 | 75 | 65 |
| 2 | 80 | 70 | 60 |
| 3 | 75 | 65 | 55 |
| 4 | 70 | 60 | 50 |
| 5 | 75 | 65 | 55 |

[illegible]

Miss Dorothy (August)
and Mary Elizabeth
1907
1908



Mean Density (mg ml⁻¹)

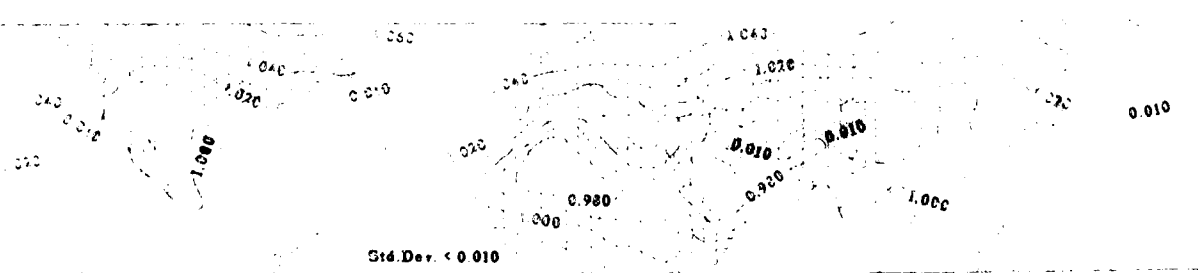
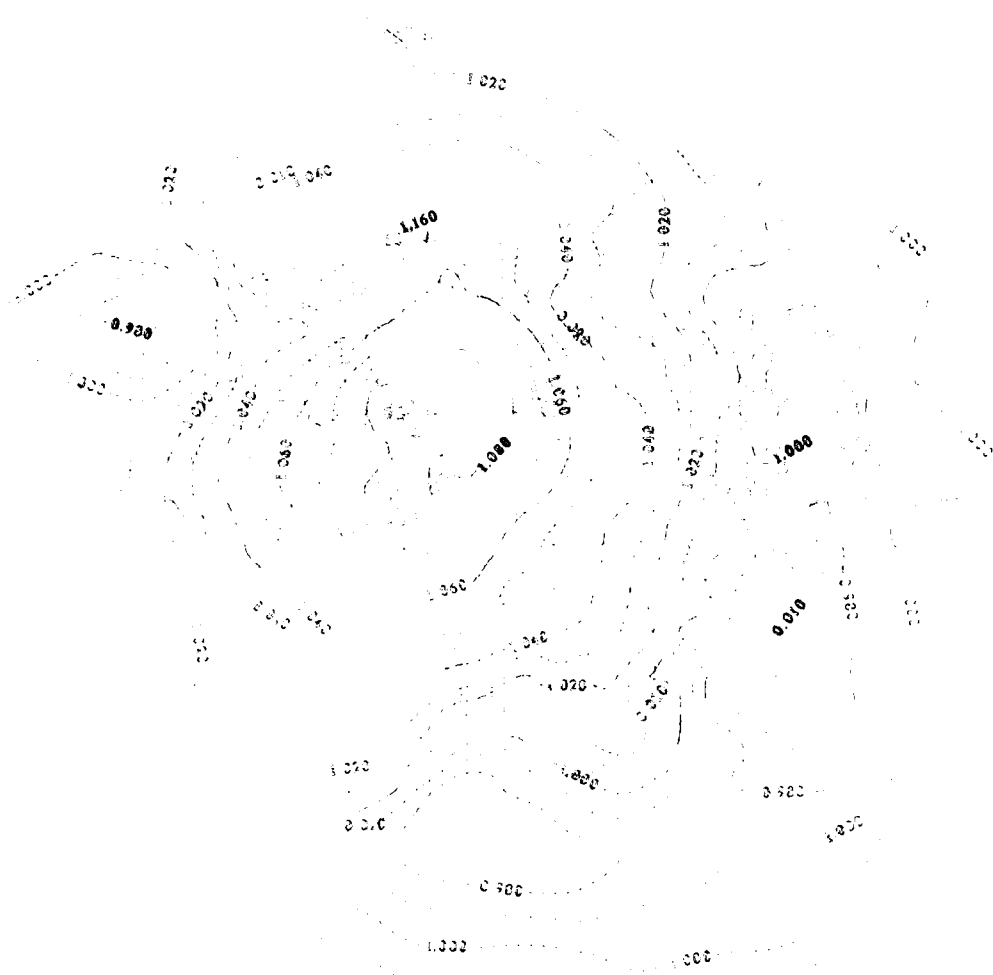
Std. Dev. (Density)

Day

Day

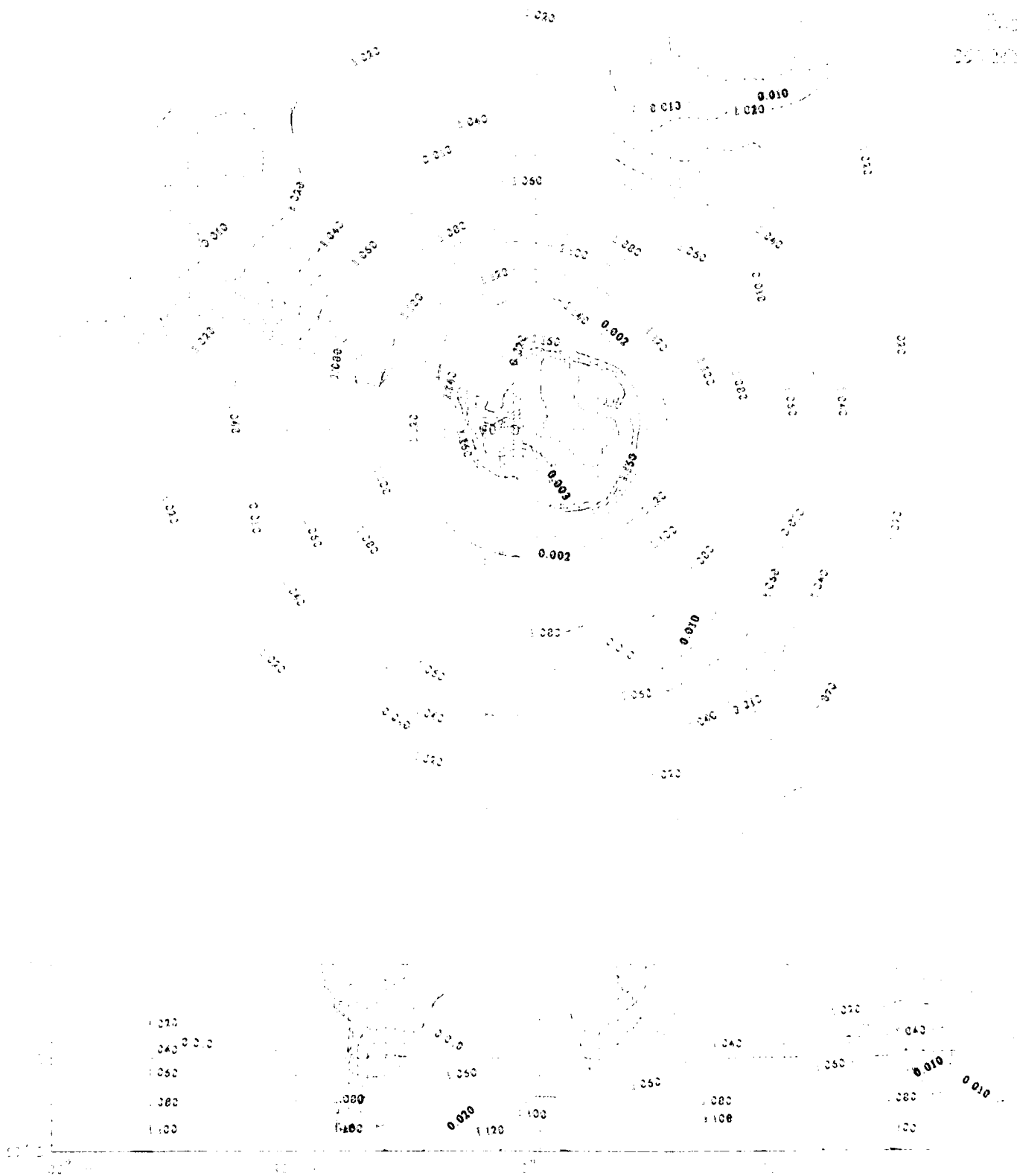
Upper and Intermediate

Western Hemisphere



Topographic Contouring
 Contour Interval: 100

Mean Elevation (meters)
 1000
 1000
 1000



Mean Density (mg/L)

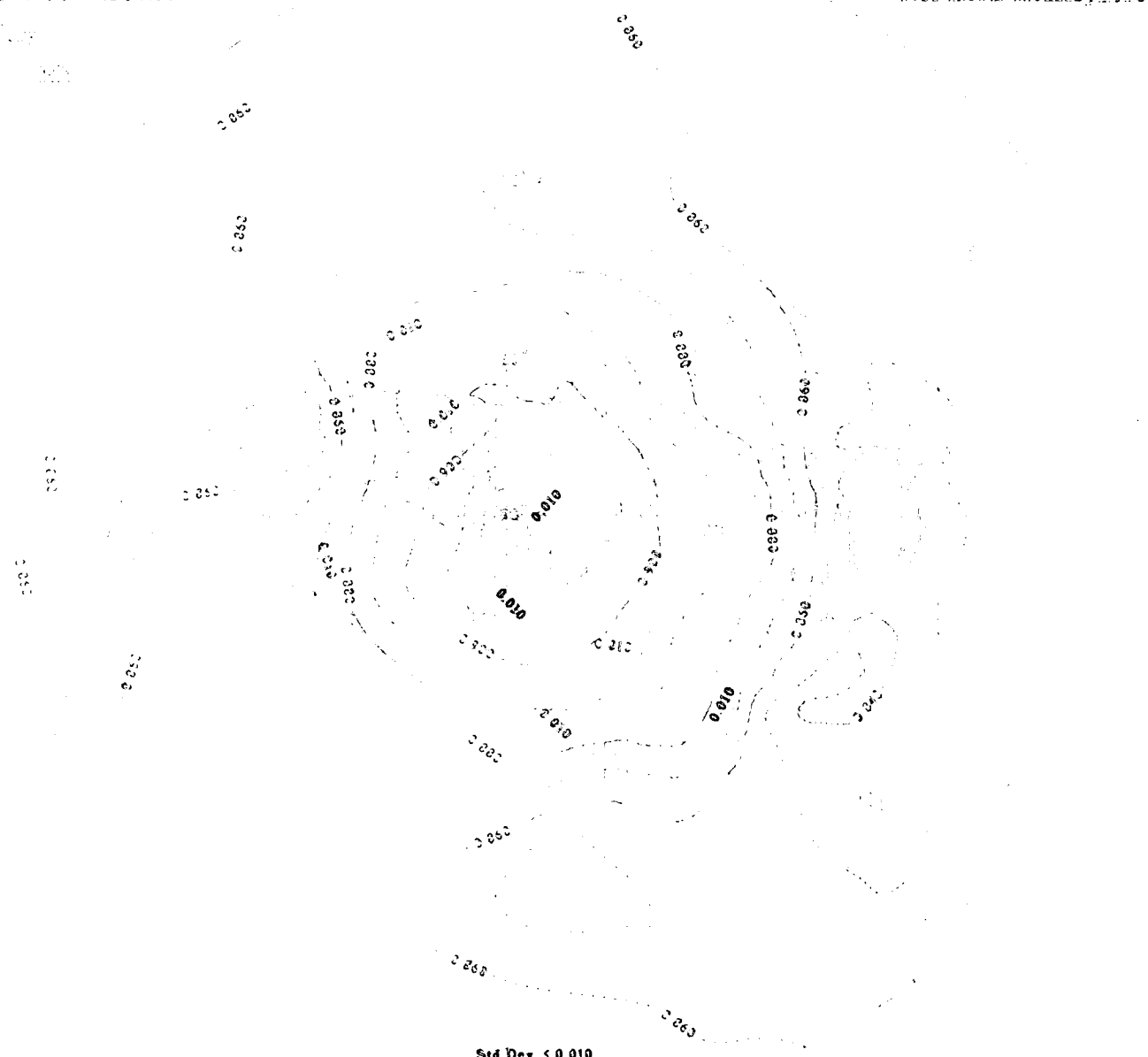
and Flow (L/min)

100

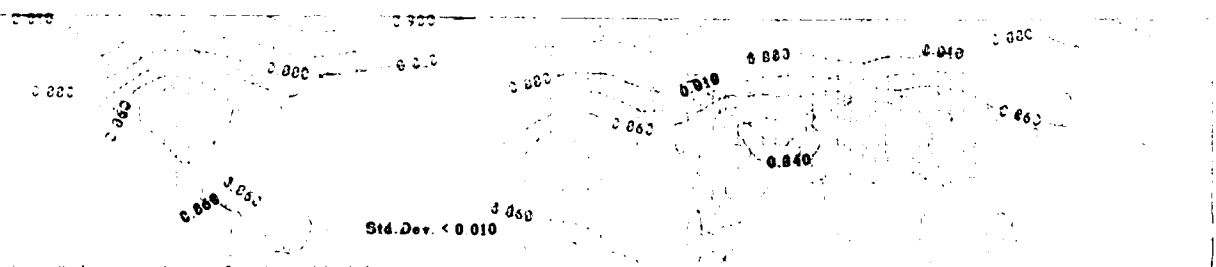
100

Upper and Lower

Mean Density



Std. Dev. < 0.010



Std. Dev. < 0.010

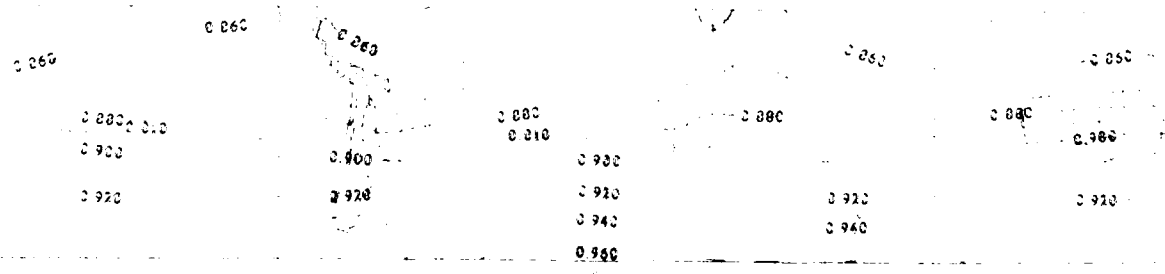
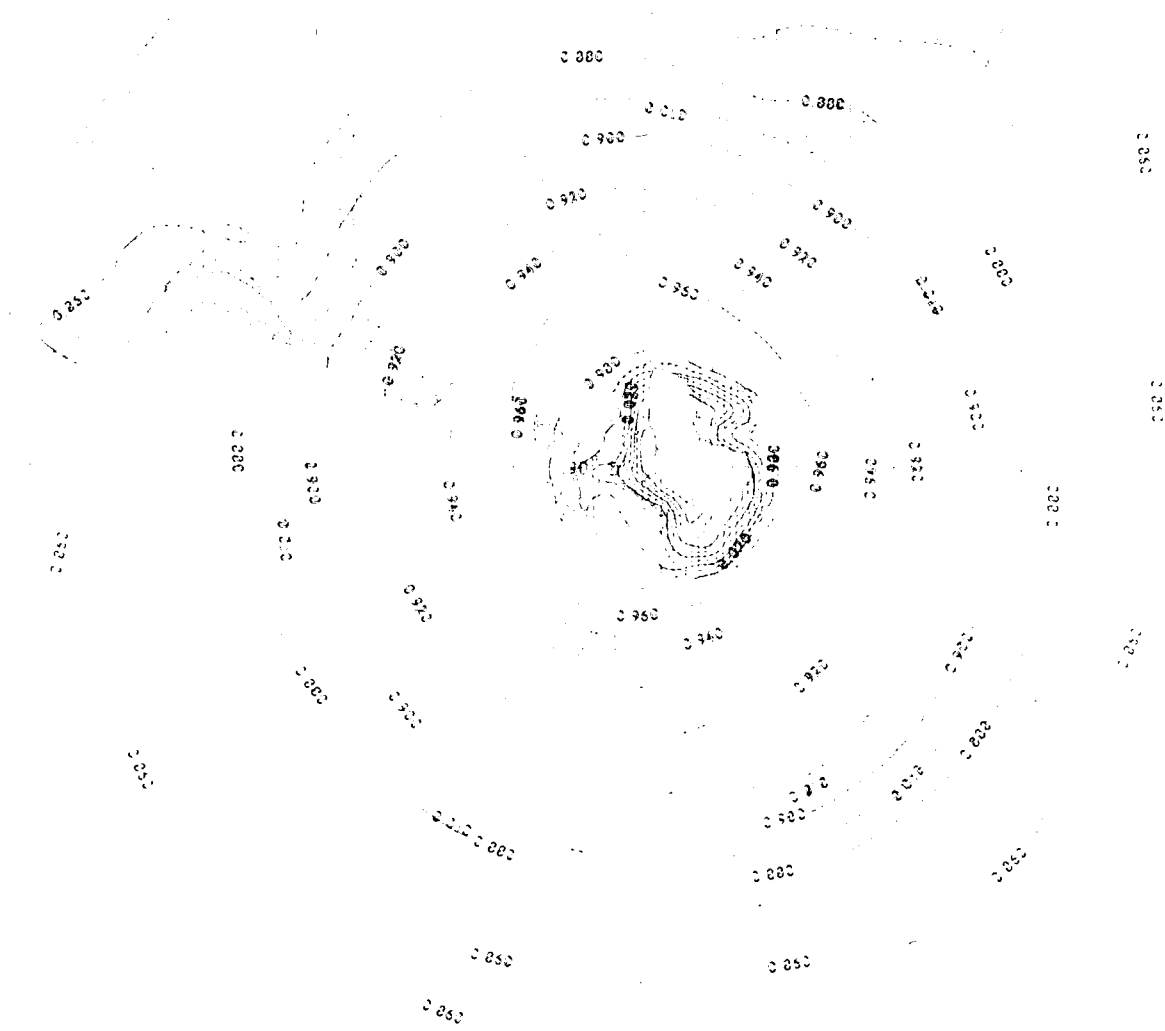
Topographic Survey
 Division of Hydrography

Mean Low Water (m.s.l.)

Chart of 1880

1880

1880



Mean Density (g cm⁻³)

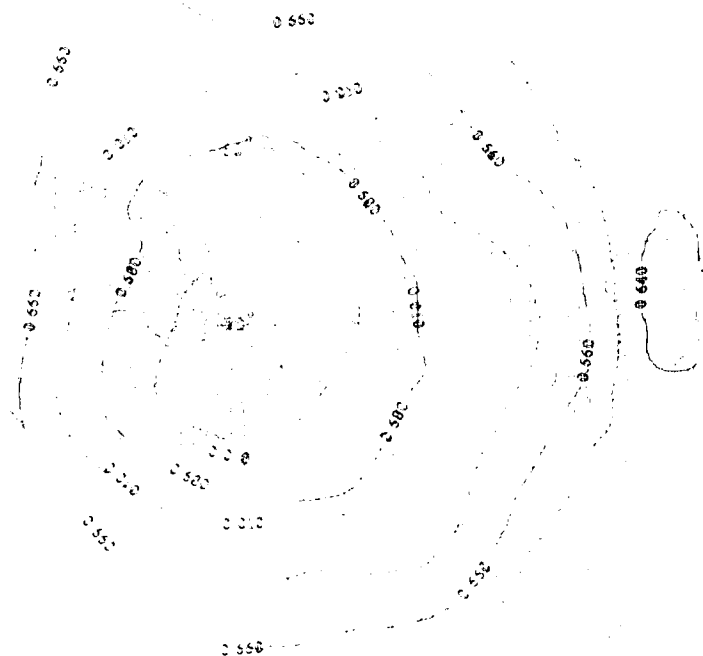
Lat. 10° N. 1000 m

Fig.

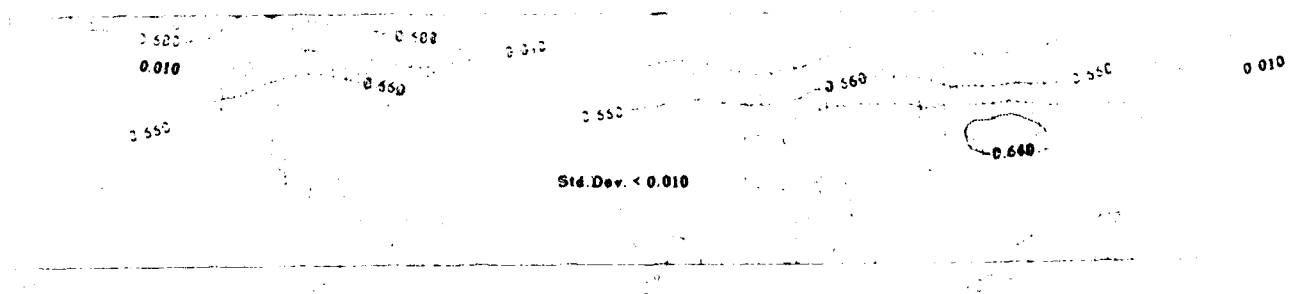
1000

Depth and Density

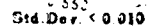
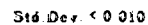
Western Hemisphere



Std. Dev. < 0.010



Std. Dev. < 0.010



Water Potential (gpm)

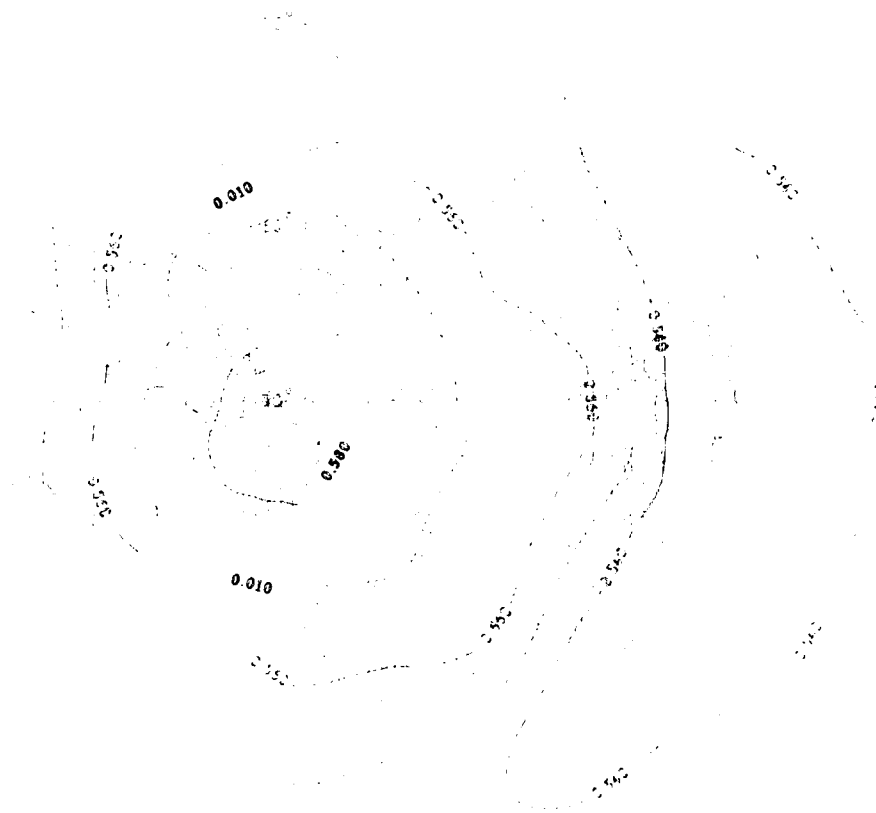
Water Flow (gpm)

Time

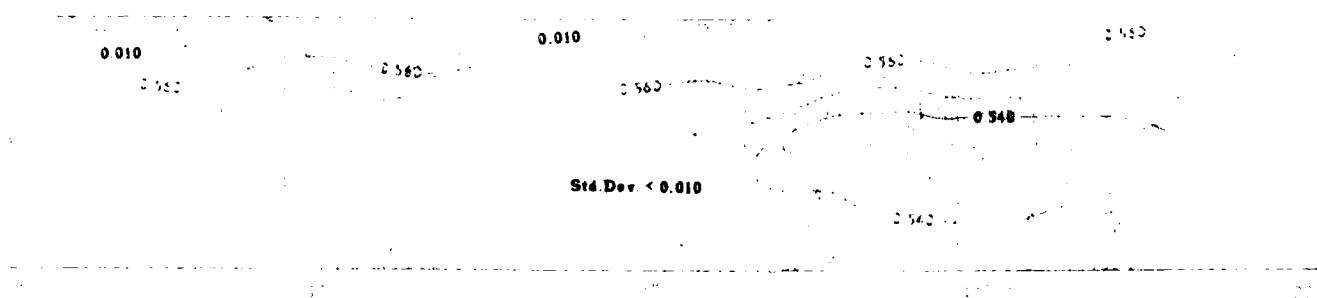
4-1-200

Topography (meters)

Direction (meters)



Std. Dev. < 0.010



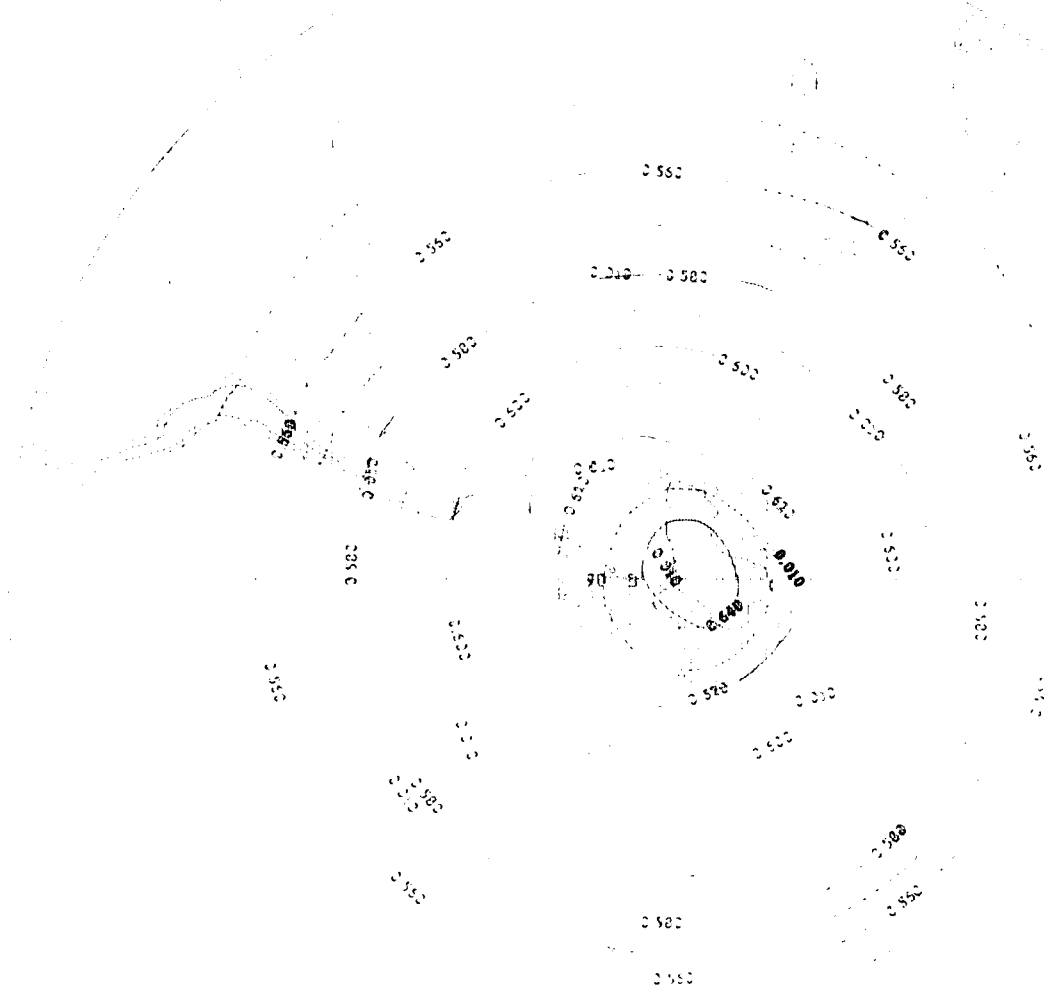
Std. Dev. < 0.010

Top 10 and Intermediate
 Depth Homophones

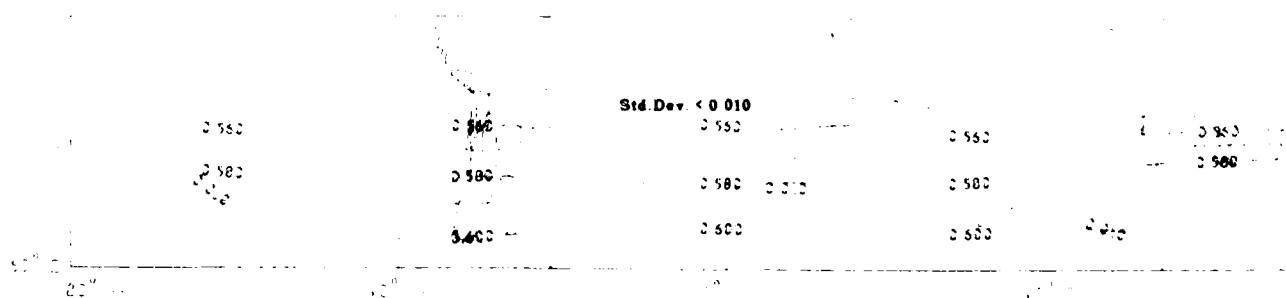
Mean Density (g/cm³)

0.550 to 0.560

4.11.22



Std. Dev. < 0.010



Mean Density (g/ml)

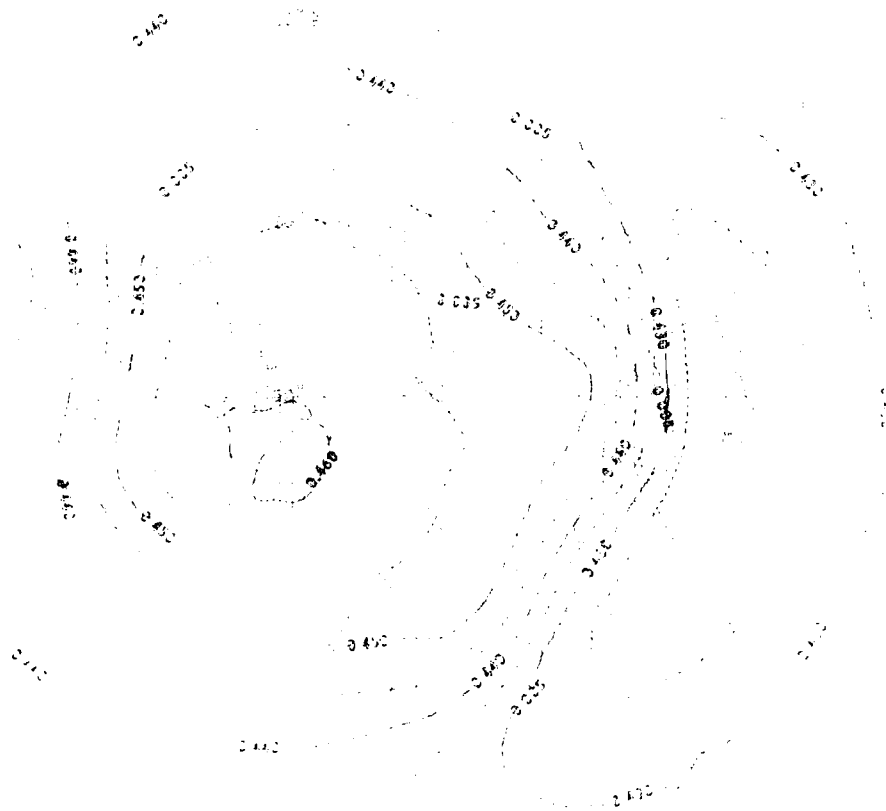
0.400 to 0.450

g/ml

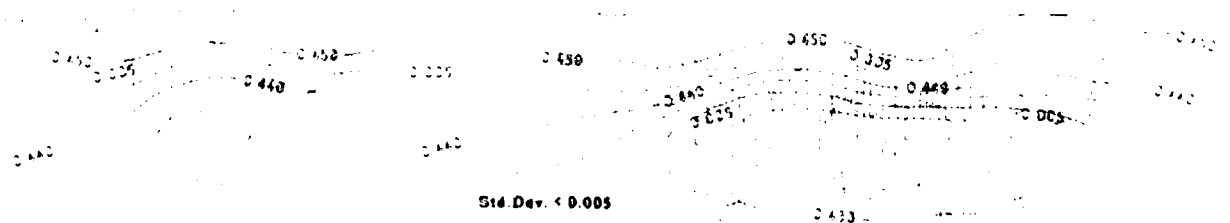
0.400

Upper and Lower Density

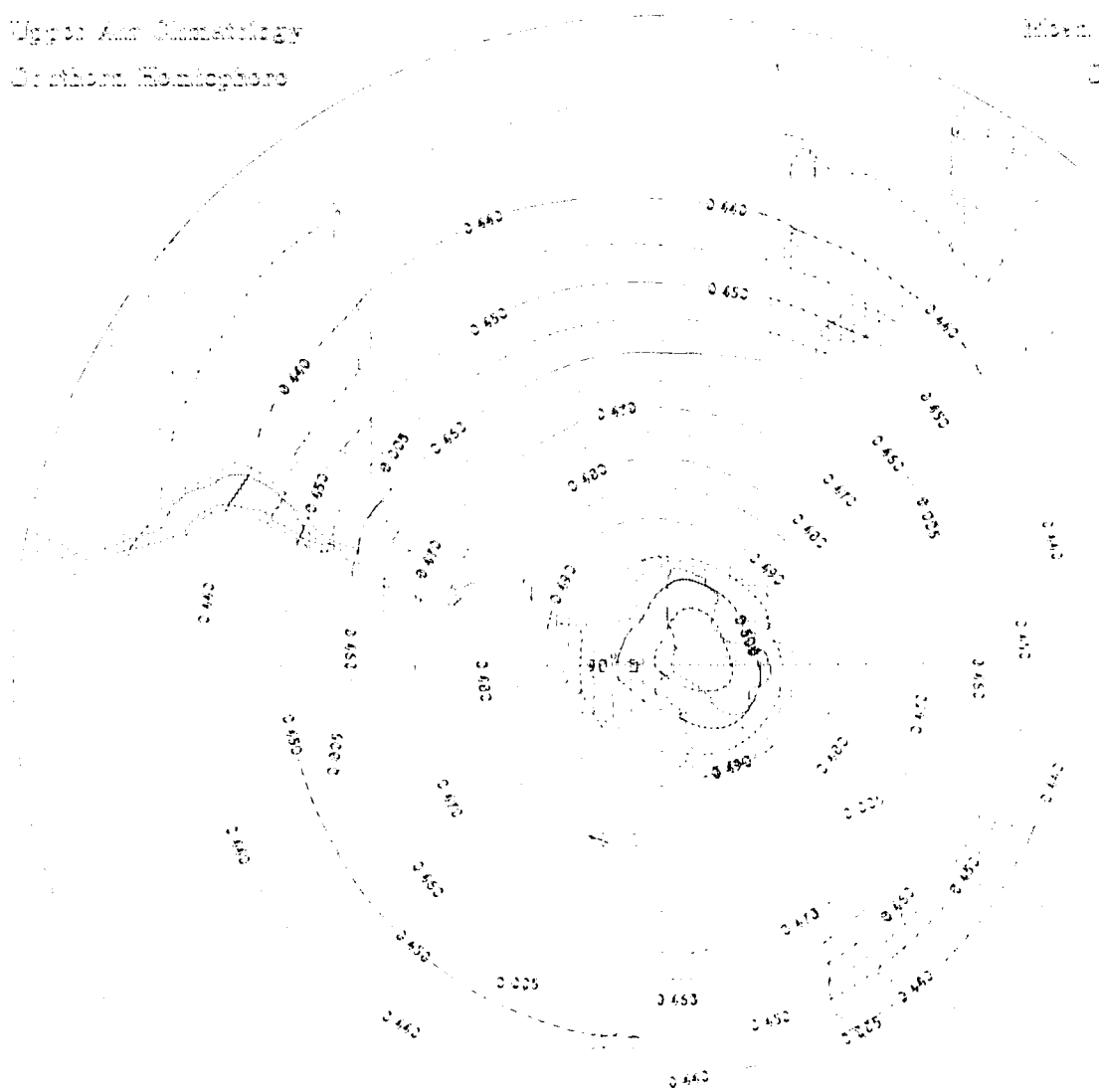
Mean Density



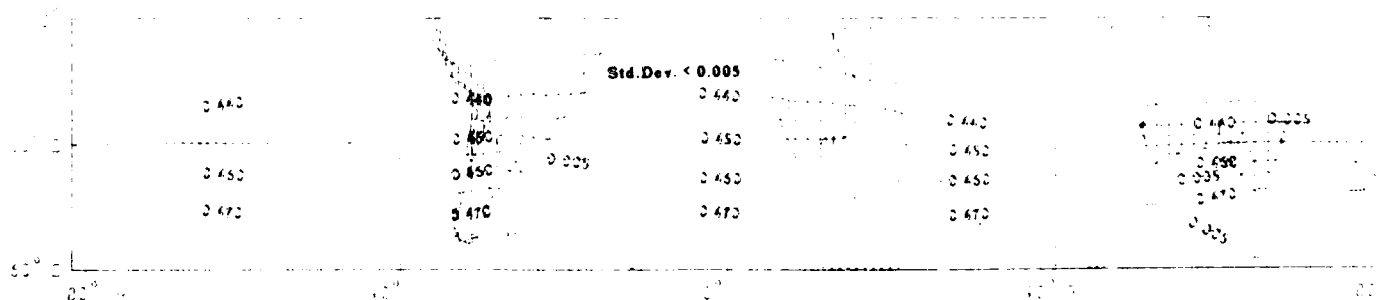
Std. Dev. < 0.005



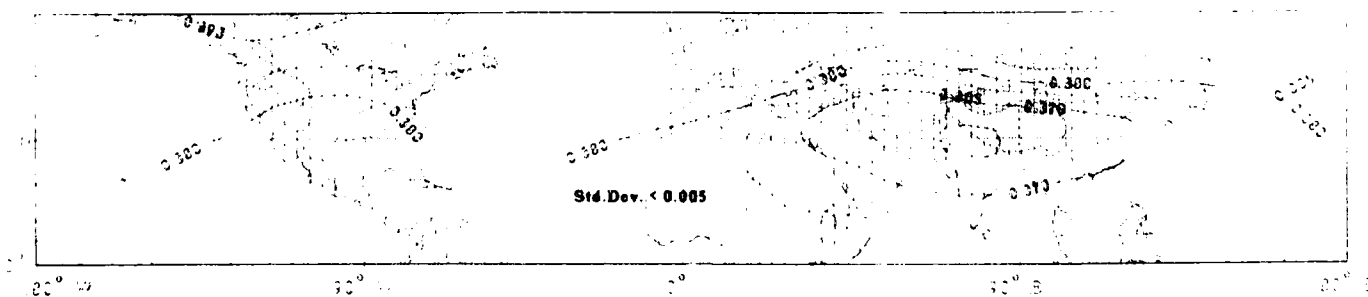
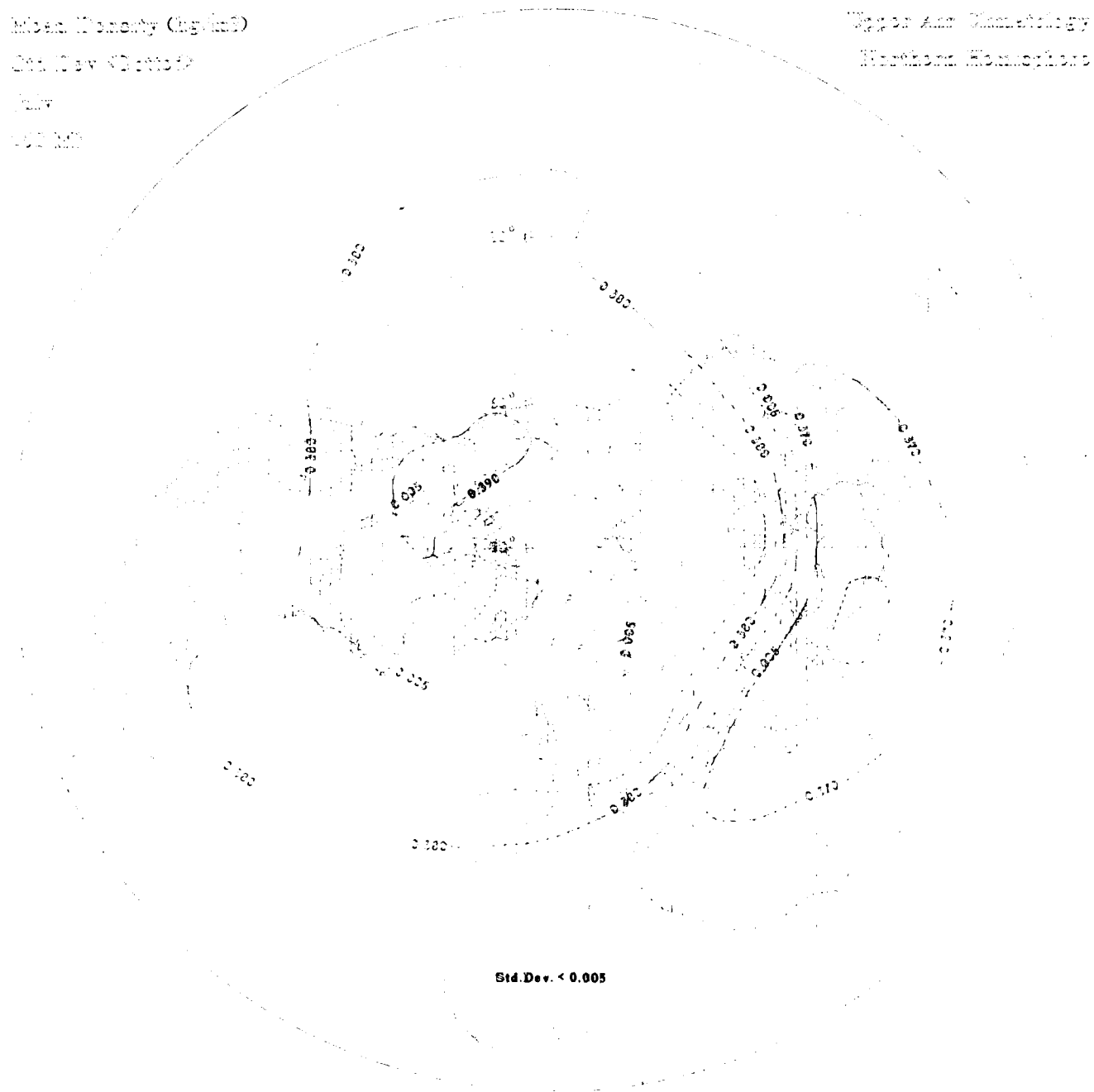
Std. Dev. < 0.005



Std.Dev. < 0.005



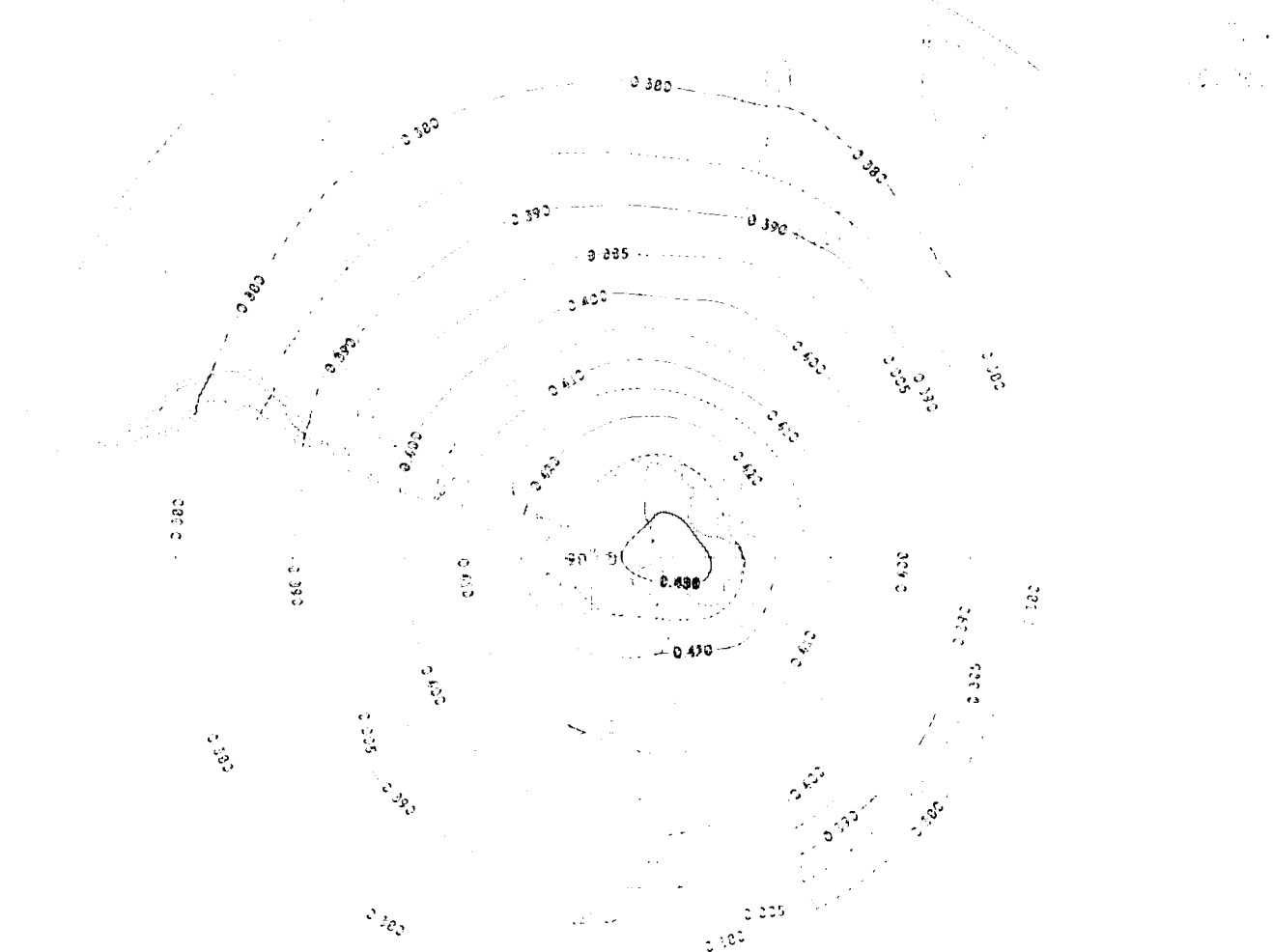
References



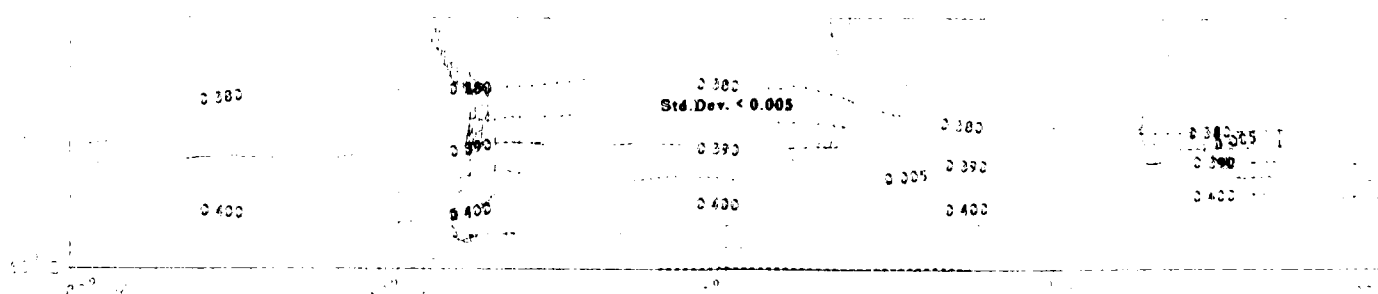
Topo and Spherology
 Prothon Kambayhara

Mean Velocity (mg. sec.)

Std. Dev. 0.005



Std. Dev. < 0.005



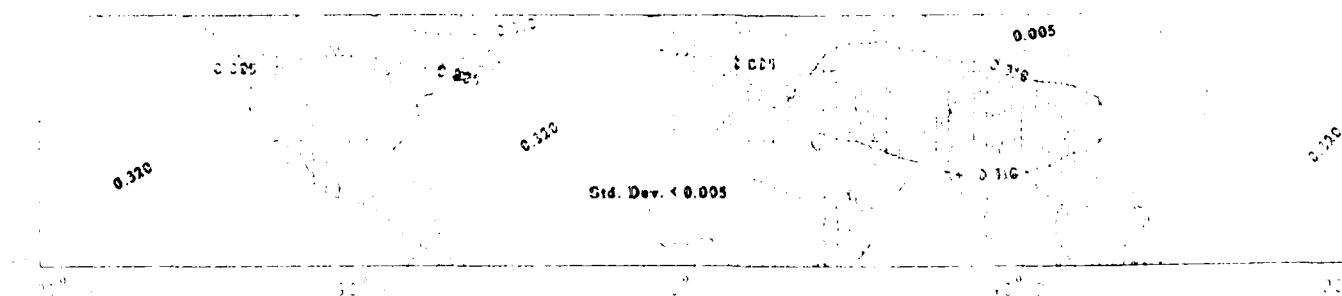
[illegible]

References

10

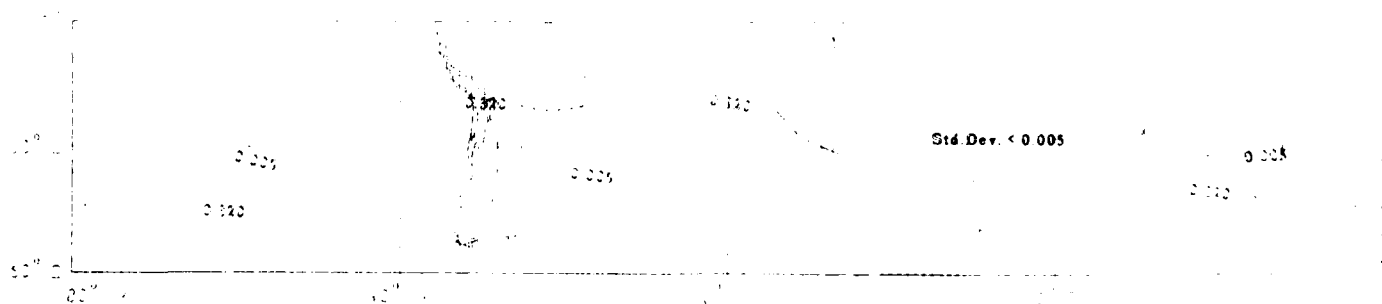
1. *Journal of the American Medical Association*, 1997; 277: 1033-1038.

Std. Dev. = 0.105



Approved: _____
Date: _____

Std. Dev. < 0.005



Mean Density (kg/m³)

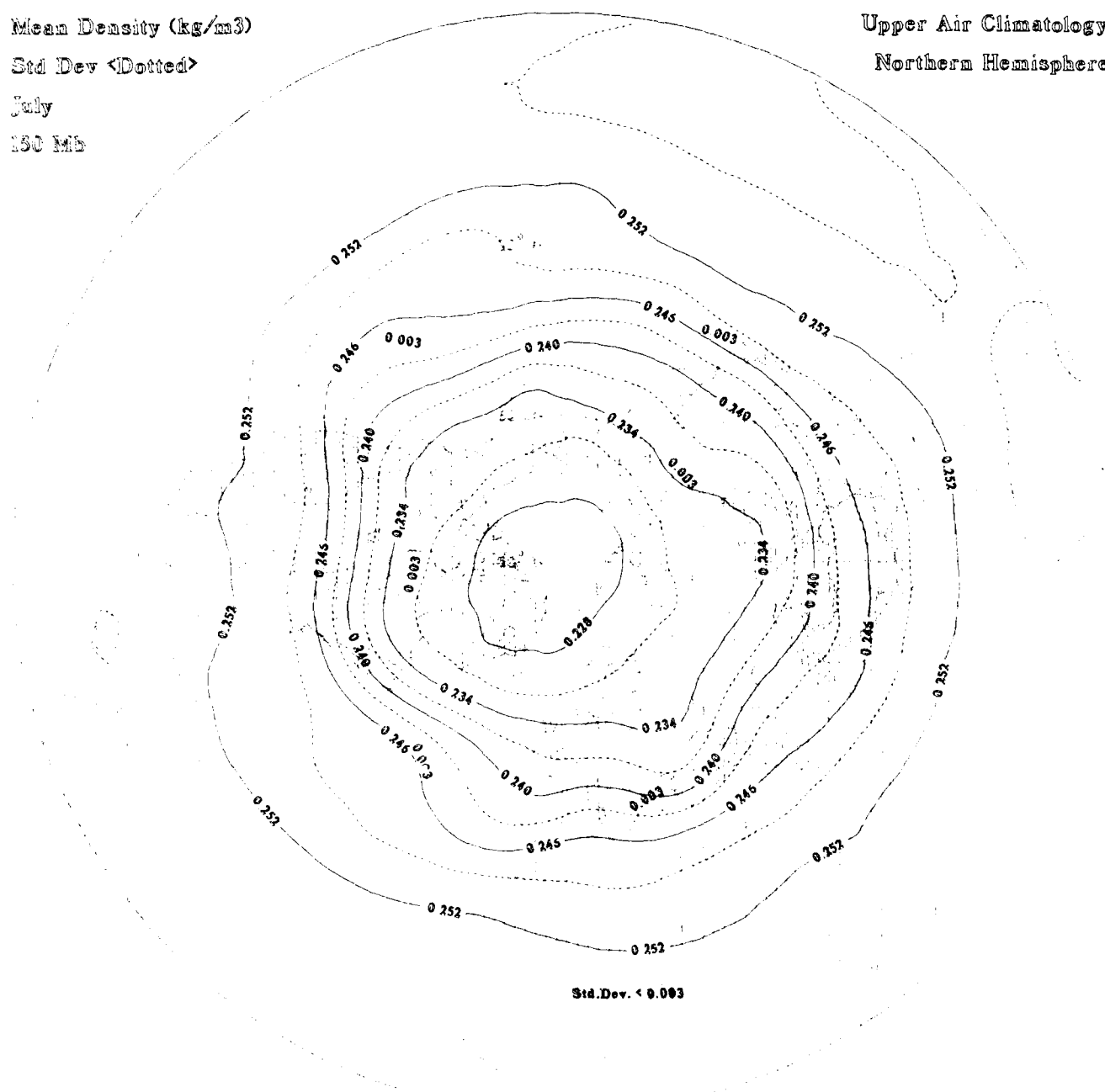
Std Dev <Dotted>

July

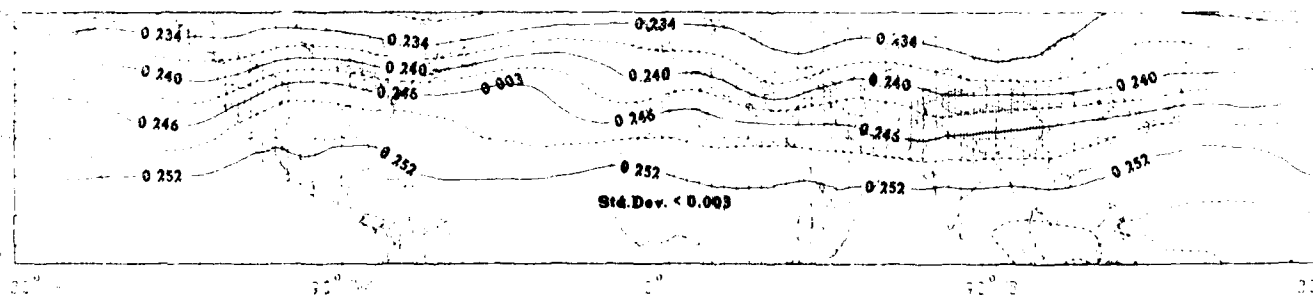
150 Mb

Upper Air Climatology

Northern Hemisphere



Std. Dev. < 0.003



Std. Dev. < 0.003

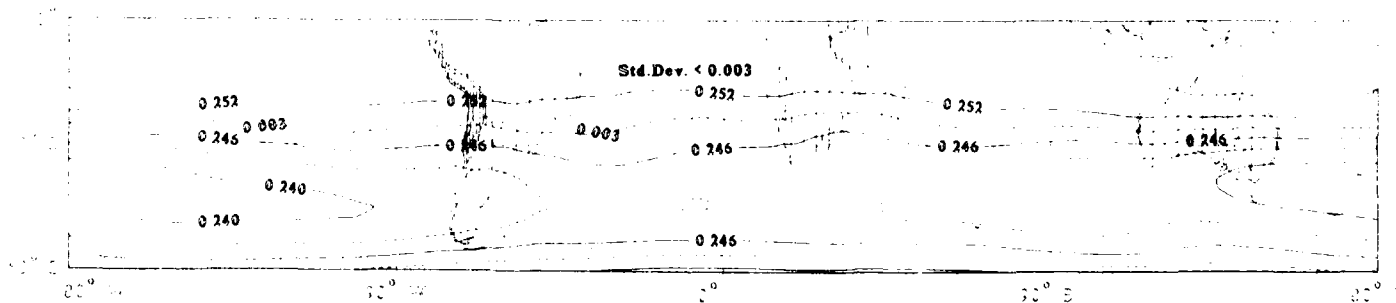
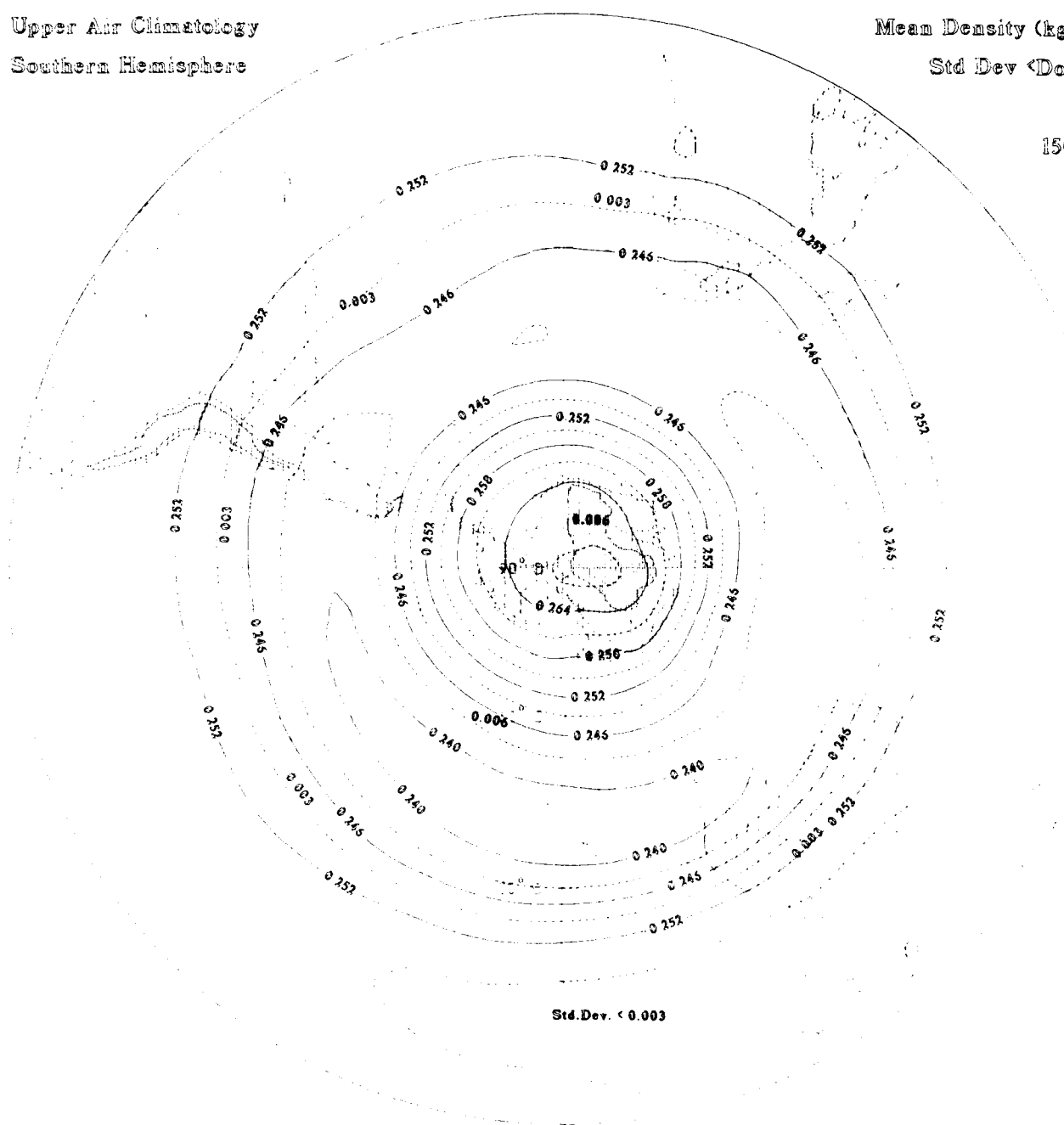
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

Std Dev <Dotted>

July

150 Mb



Mean Density (kg/m³)

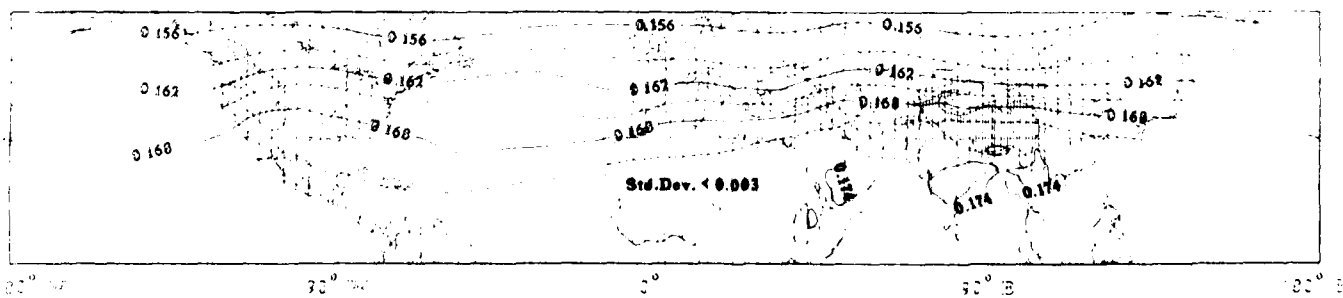
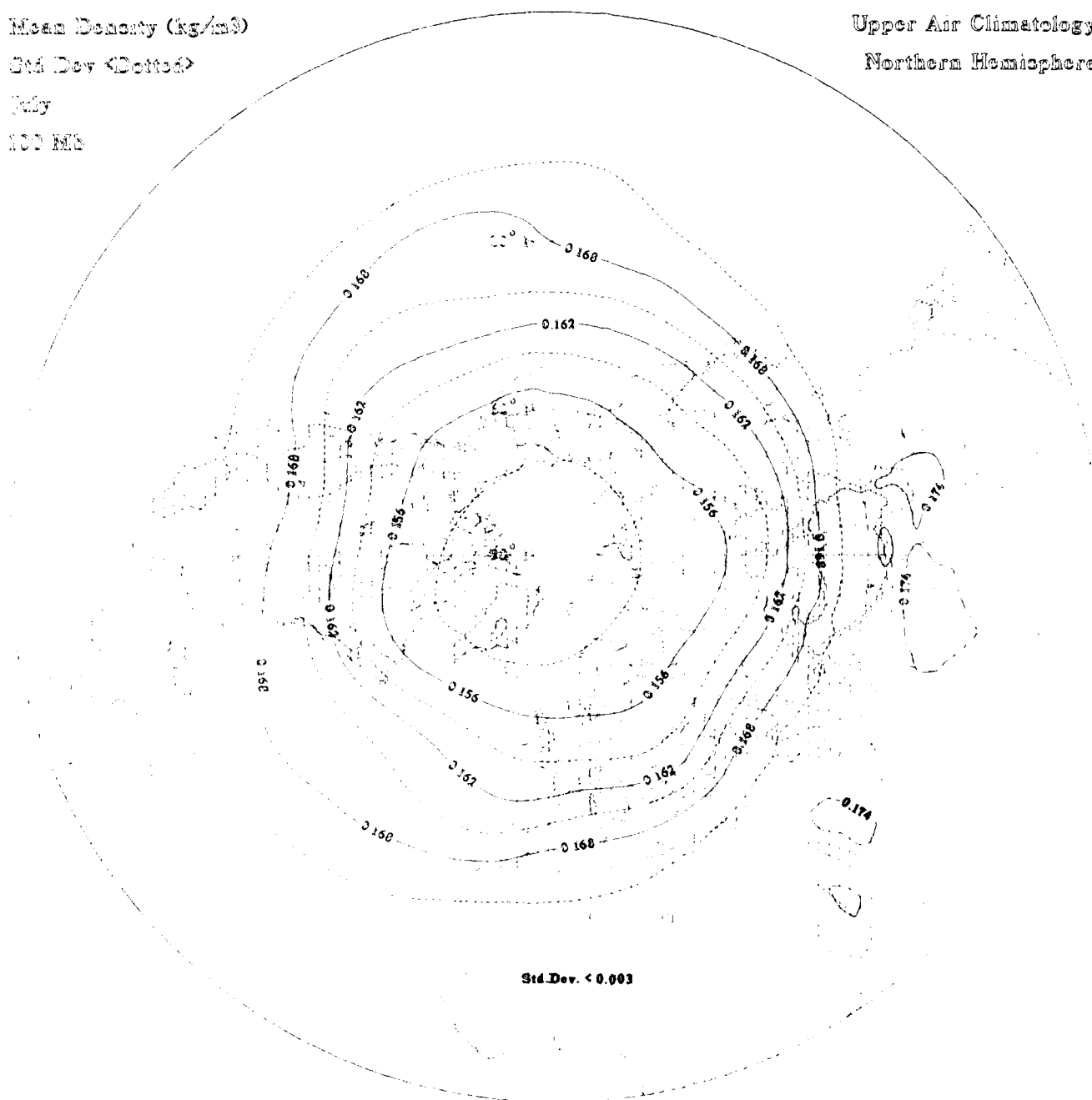
Std. Dev. (Dotted)

July

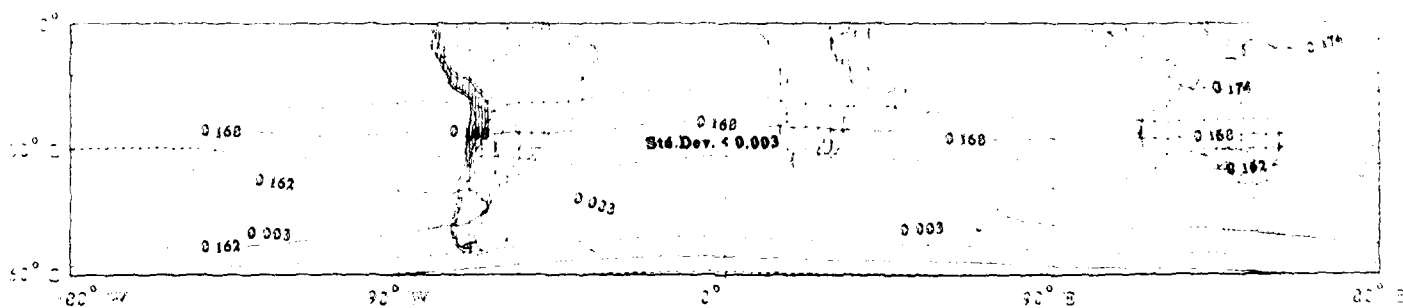
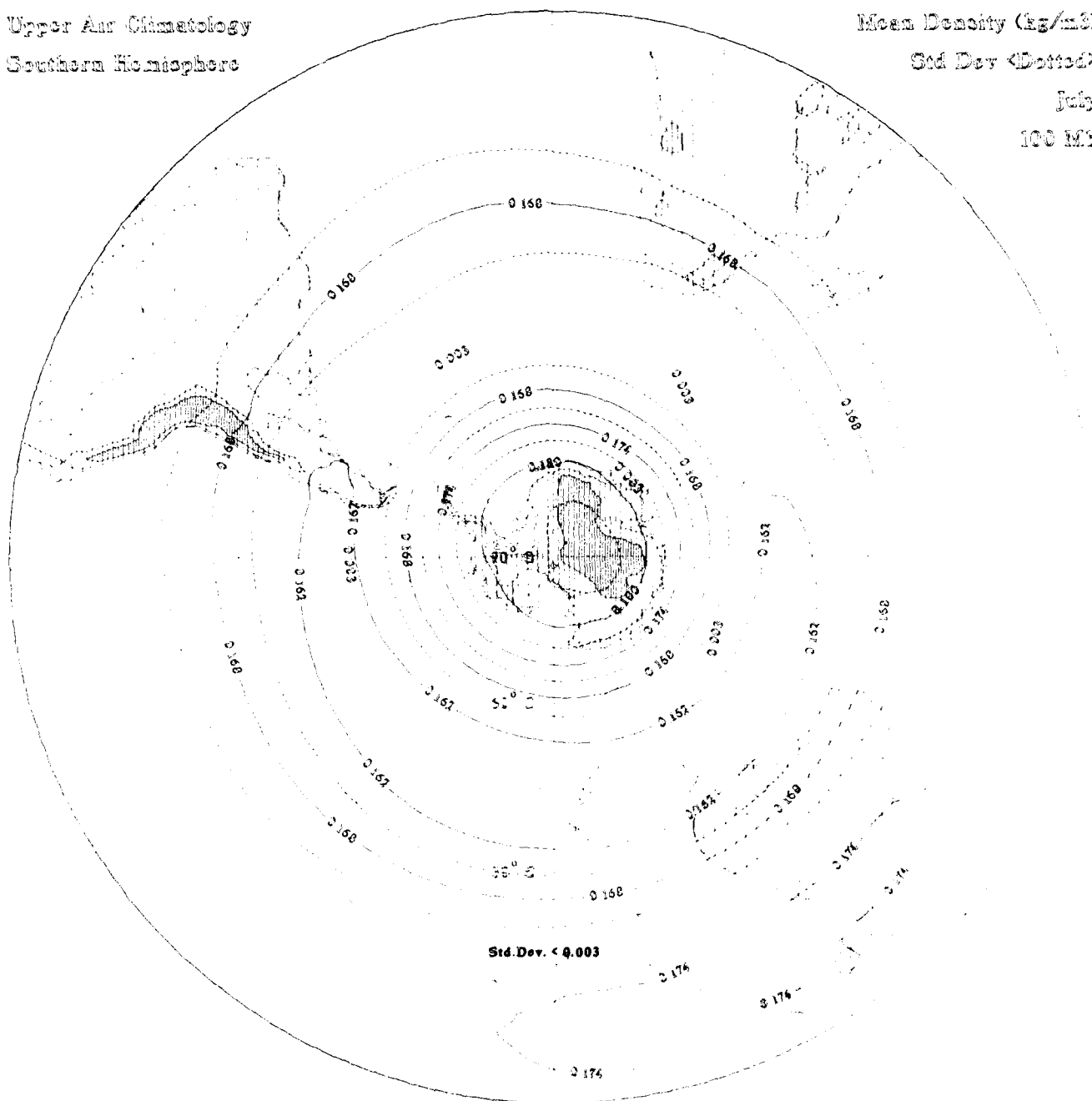
100 MB

Upper Air Climatology

Northern Hemisphere

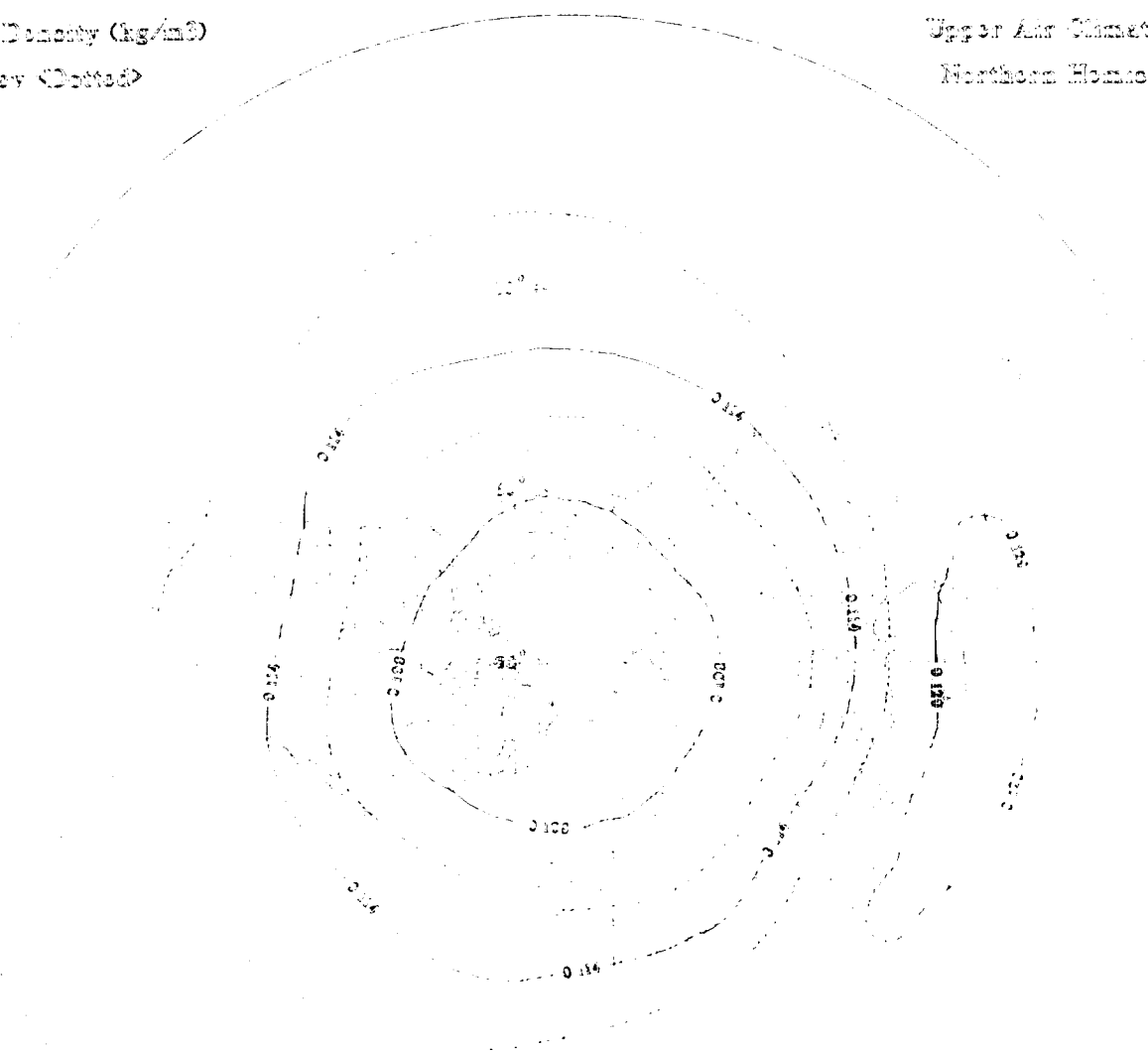


Mean Density (kg/m³)
Std Dev <Dotted>
July
100 MB

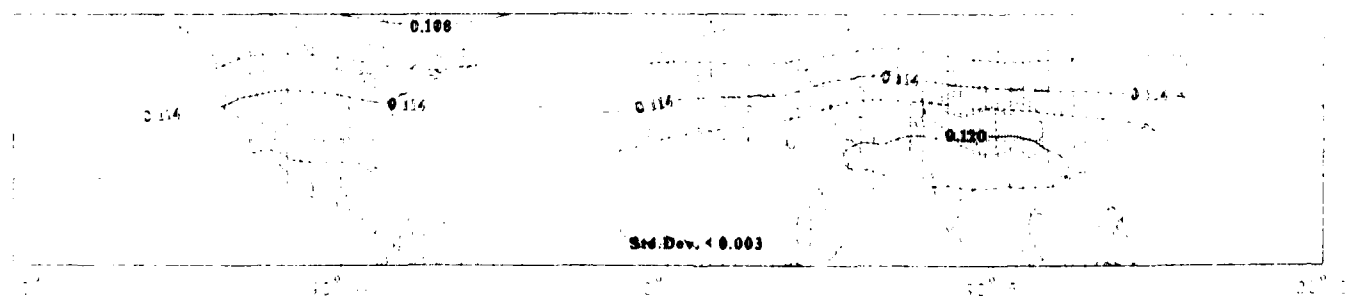


2000

Northern Hemisphere



Std.Dev. < 0.003



Std. Dev. = 0.003

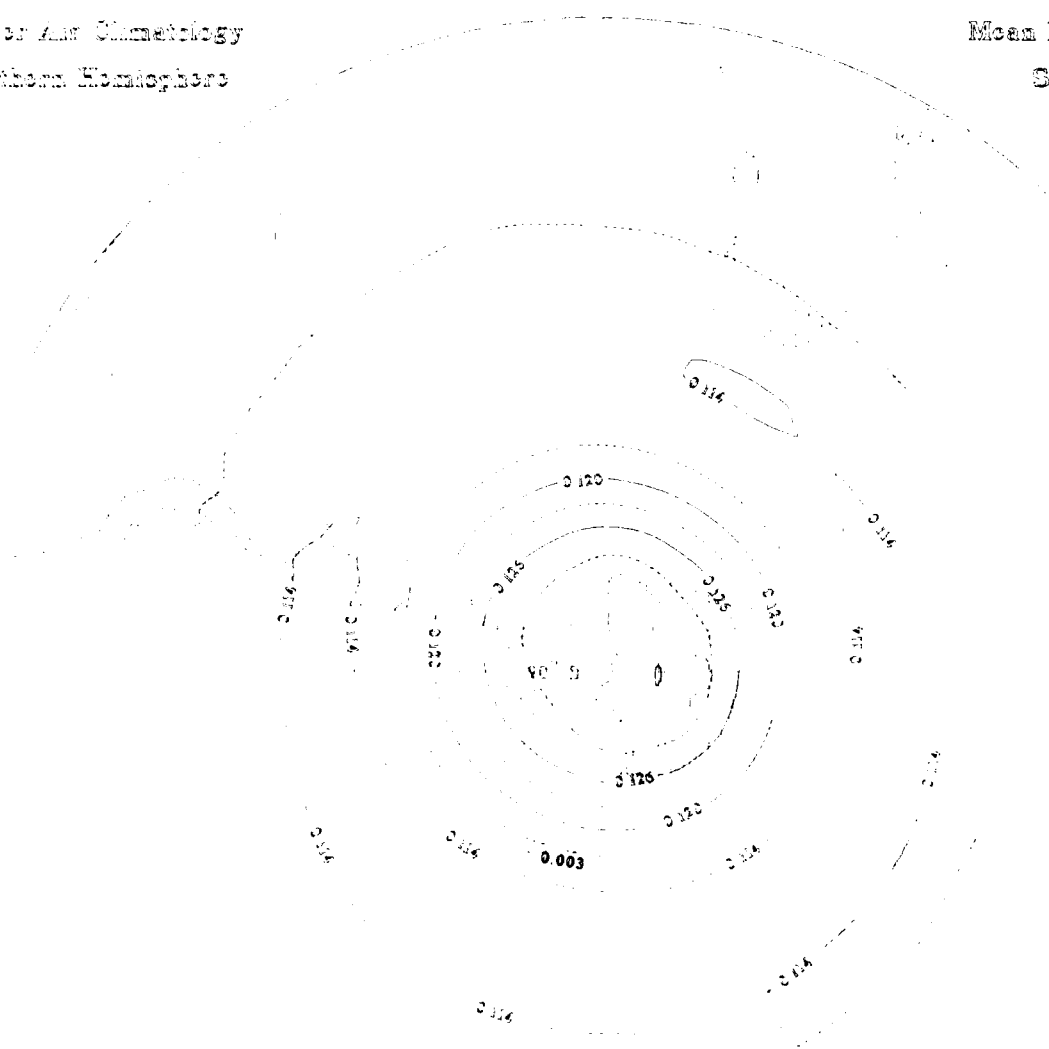
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

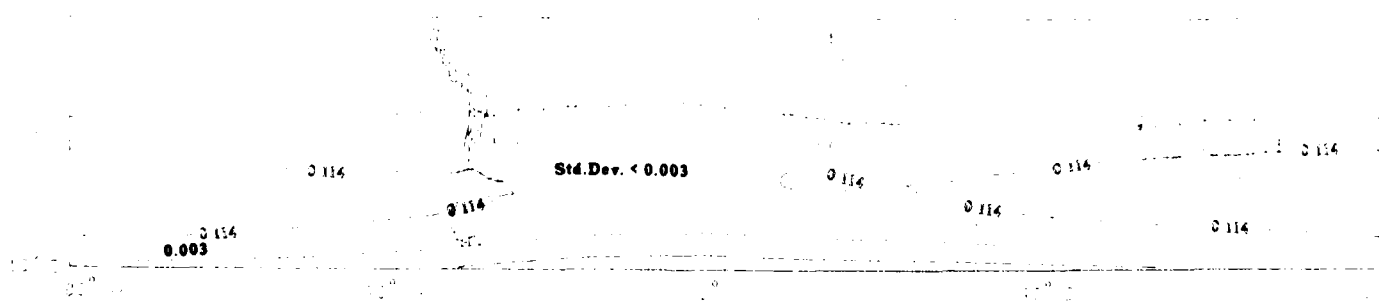
Std Dev (Dotted)

July

71 MS



Std.Dev. < 0.003



Mean Density (kg/m³)

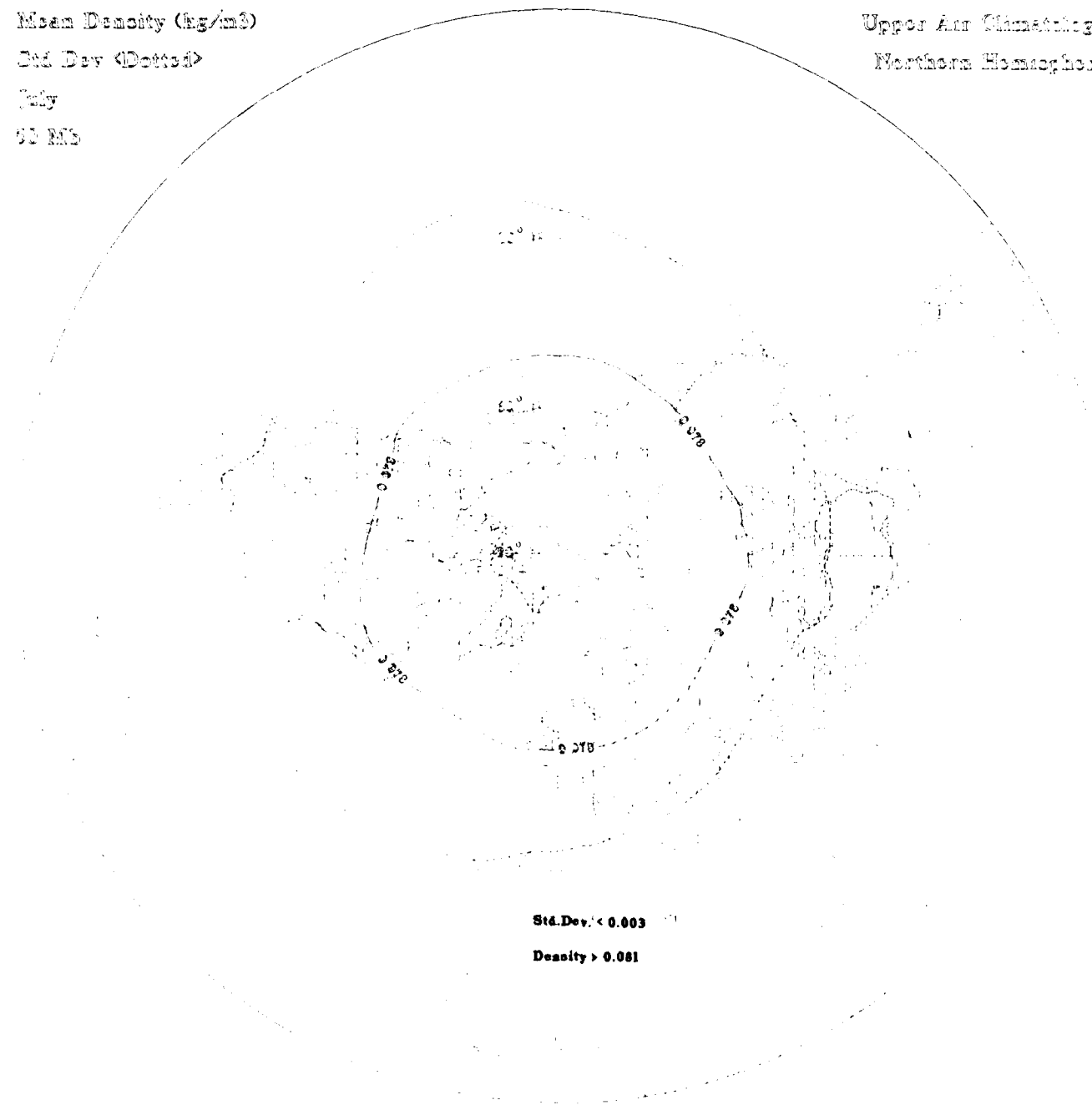
Std Dev (Dotted)

July

50 MB

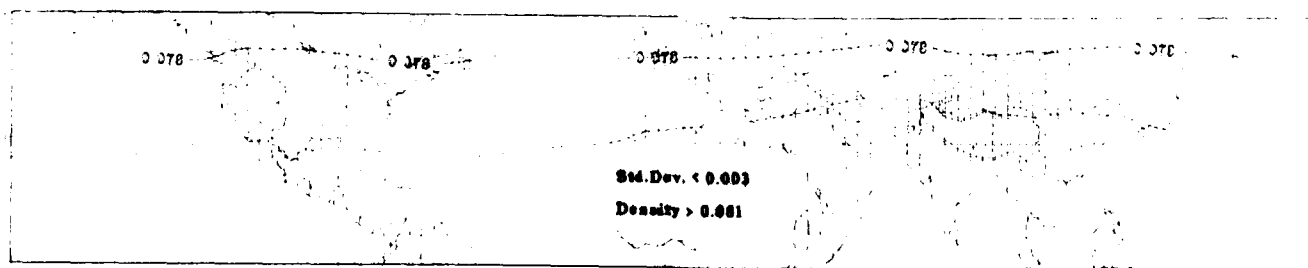
Upper Air Climatology

Northern Hemisphere



Std.Dev. < 0.003

Density > 0.001



Std.Dev. < 0.003

Density > 0.001

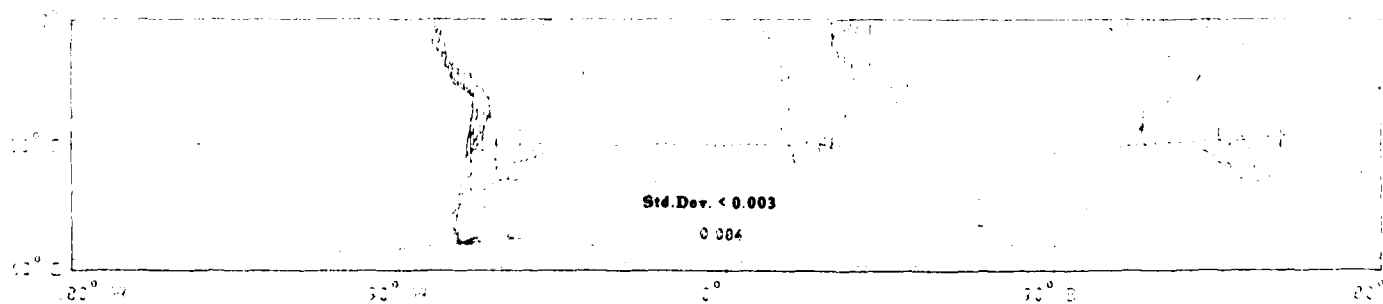
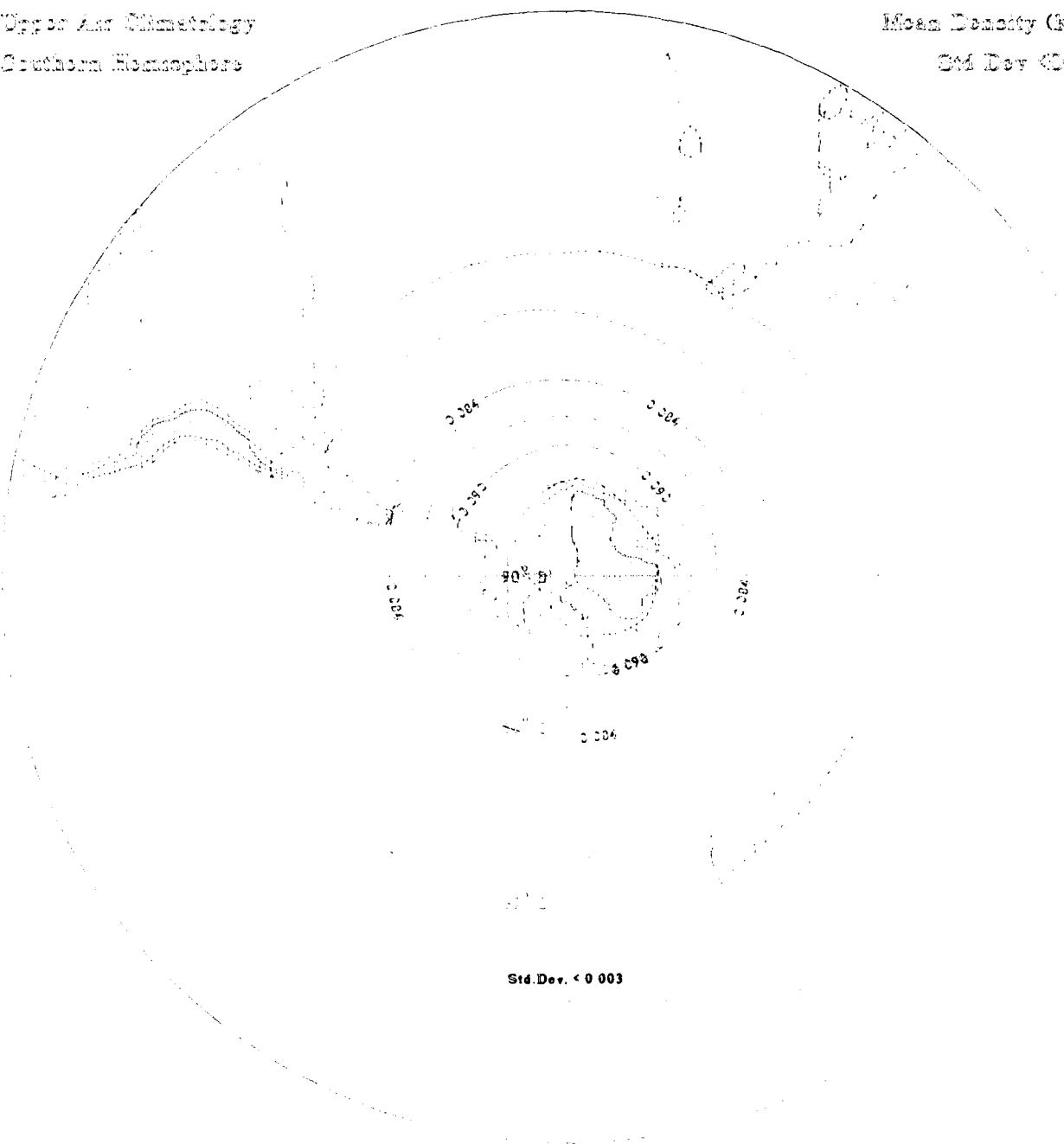
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

Std Dev (Cm/s)

July

51 201



Mean Density (g/cm³)

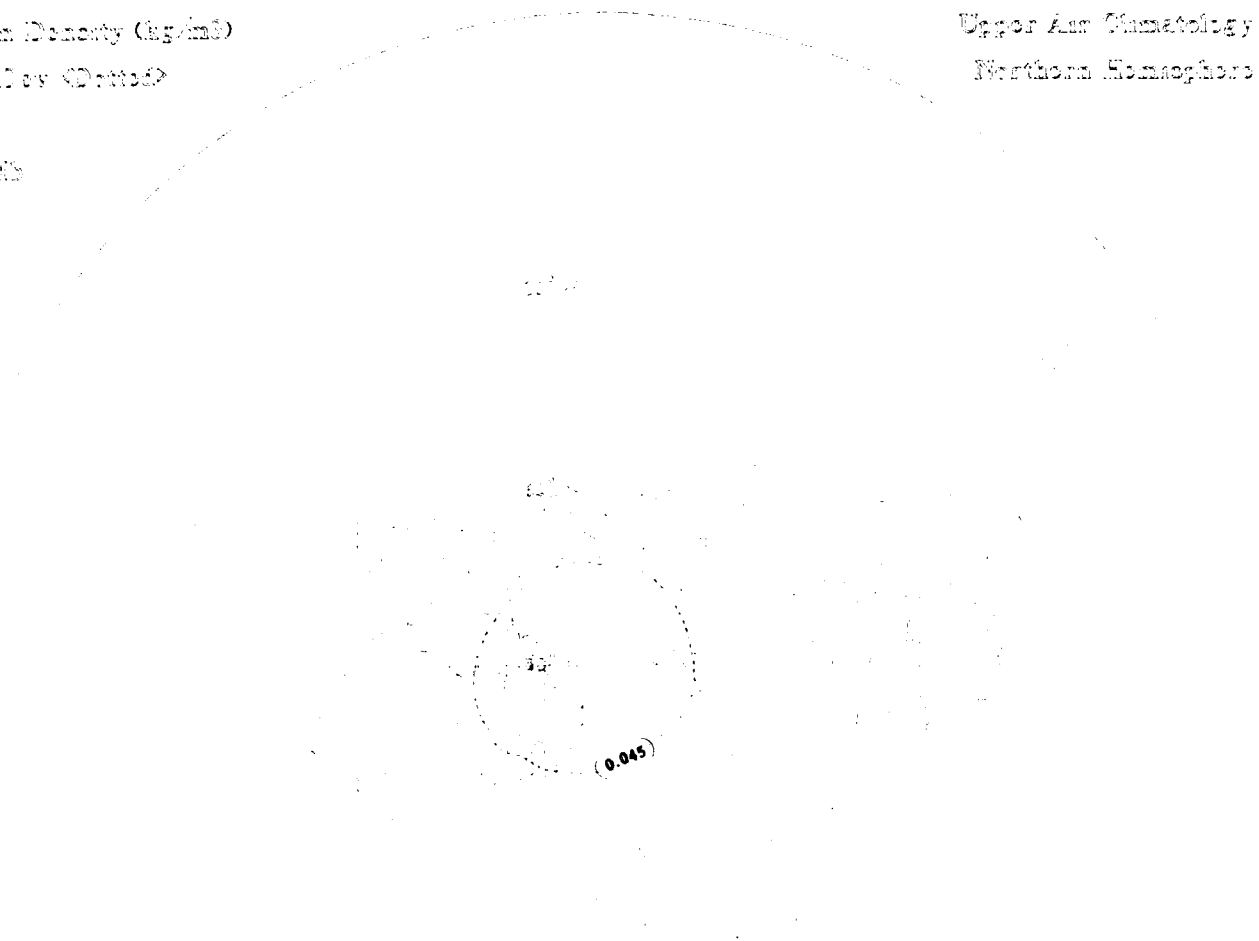
Std. Dev. (Dotted)

July

10 MB

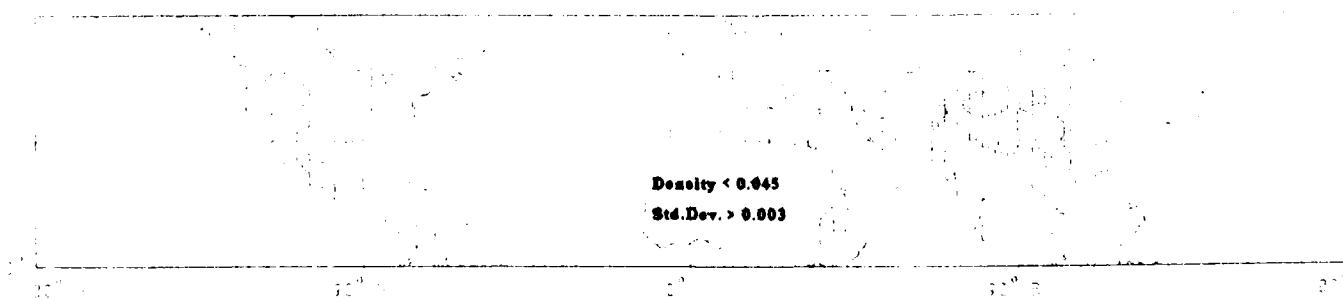
Upper Air Climatology

Northern Hemisphere



Std. Dev. < 0.003

Density > 0.045



Density < 0.045

Std. Dev. > 0.003

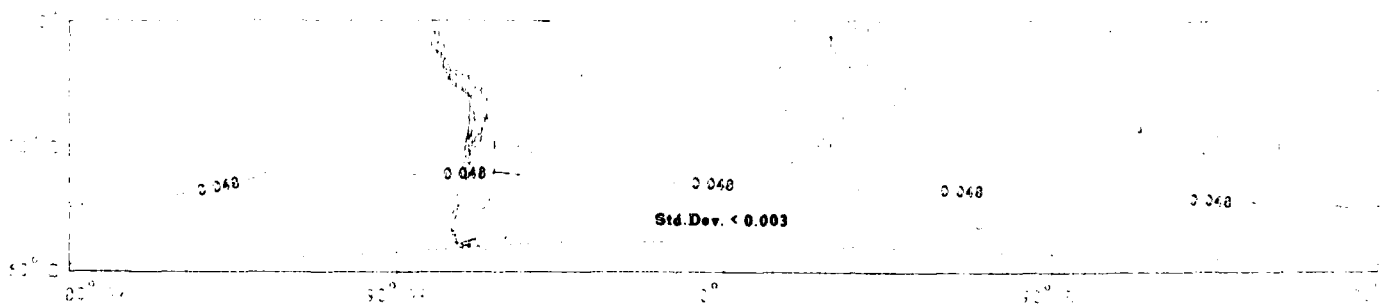
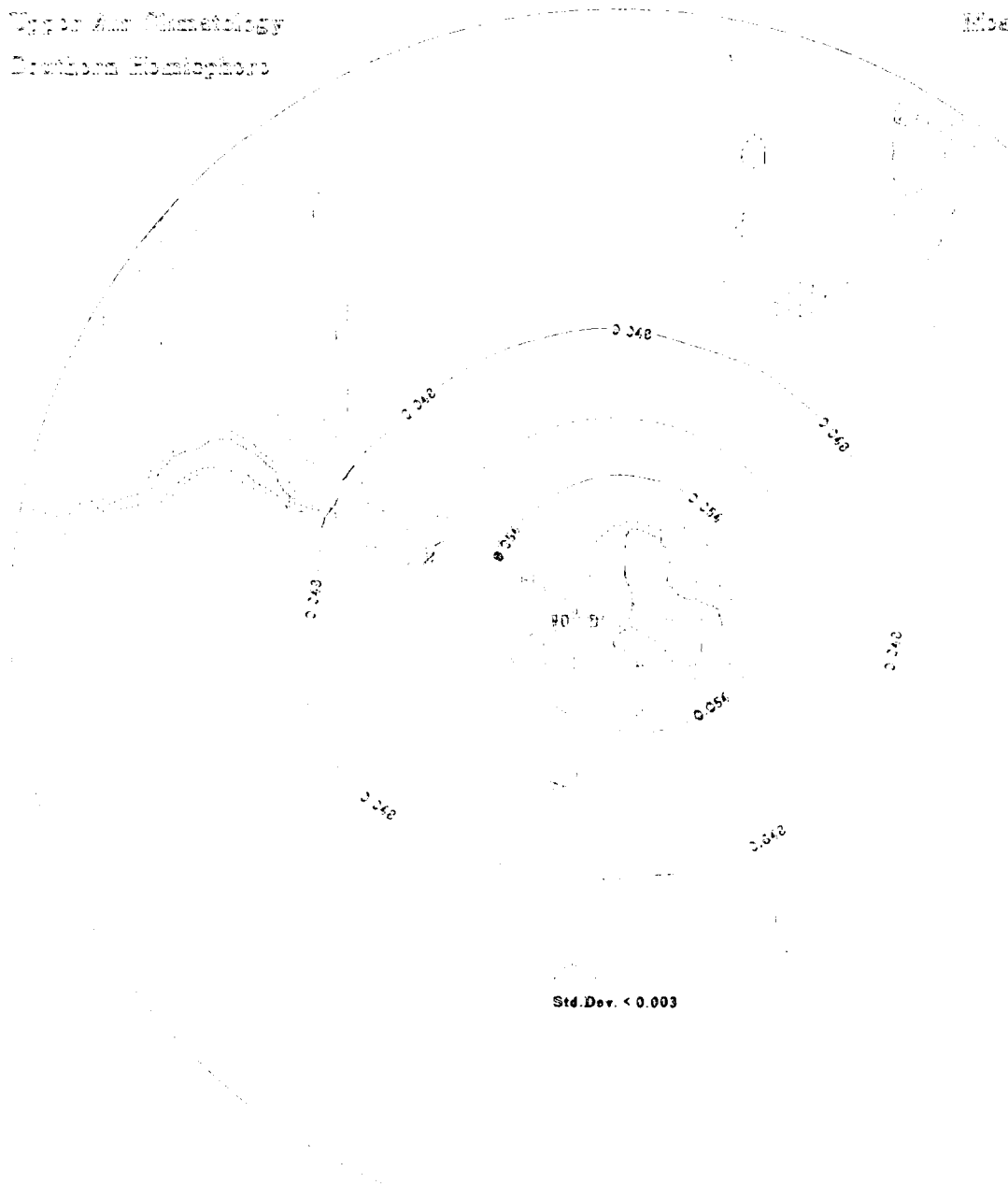
Upper Air Chemistry
 Breckenridge Homosphere

Mean Density (kg/m³)

Std. Dev. (Density)

July

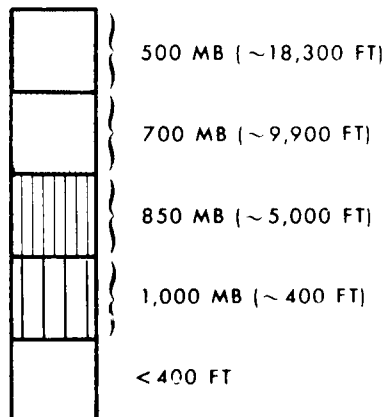
1983



**STANDARD DEVIATION OF HEIGHT
STANDARD DEVIATION OF VECTOR MEAN WIND
(13 LEVELS, 1000 TO 30 MB)**

- Contours of standard deviation of height (solid lines) in geopotential dekameters
- Standard deviation of height labeled interval:
 - 3 dekameters (30 meters) - 1000 MB to 400 MB
 - 6 dekameters (60 meters) - 300 MB to 200 MB
 - 4 dekameters (40 meters) - 150 MB to 30 MB
- Contours of standard deviation of vector mean wind (dashed lines) in knots
- Standard deviation of vector mean wind labeled interval: 5 knots
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



Height (ftm) Old Day (Old)

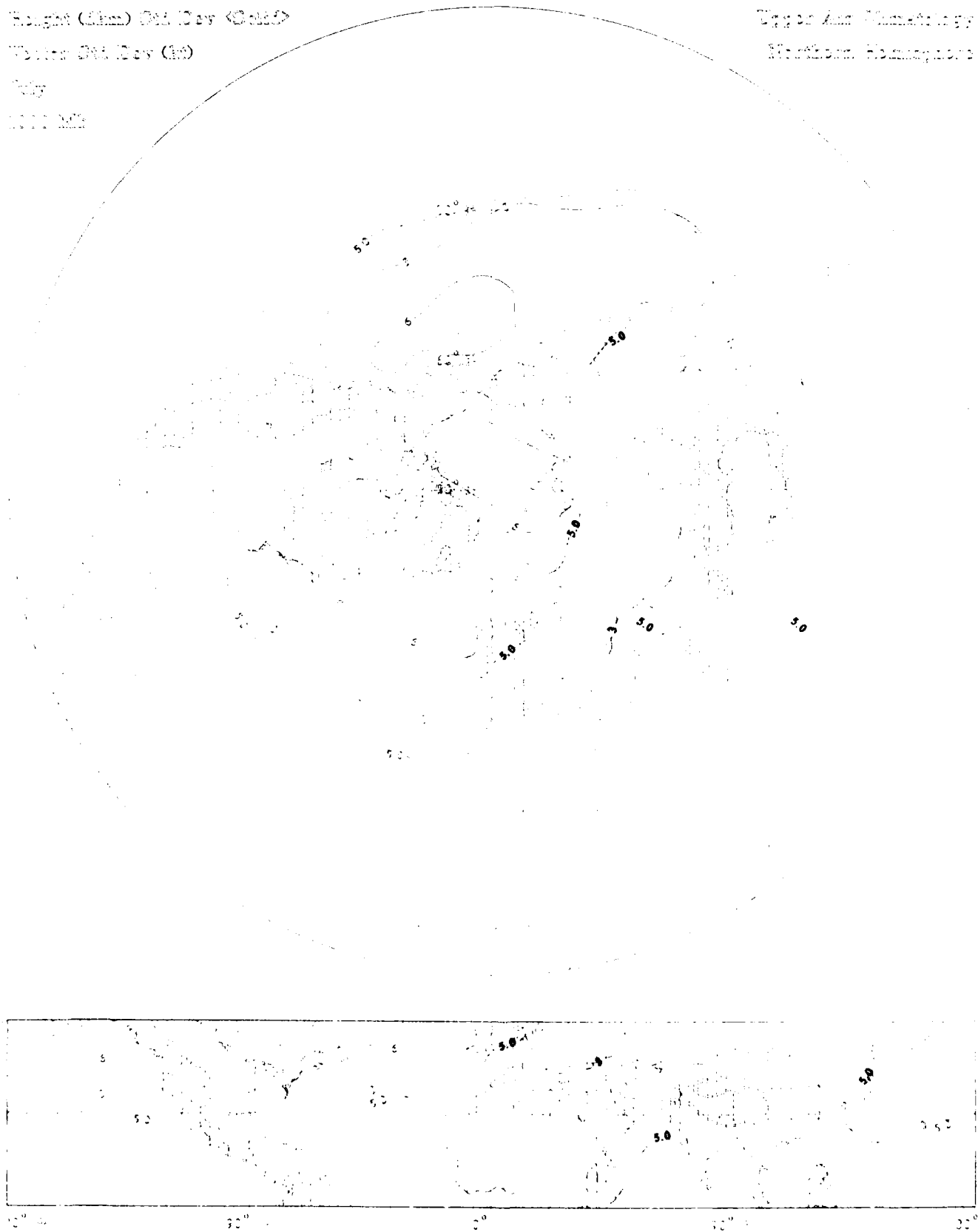
Water Old Day (Old)

July

1977-1978

Upper and Lower

Blackburn Homestead



Topographic Map
 of the Pacific

Region (km) 0.0 10.0 20.0

Water Depth (m)

100

200



Figure 6 (cont.) 1000 ft. Contour

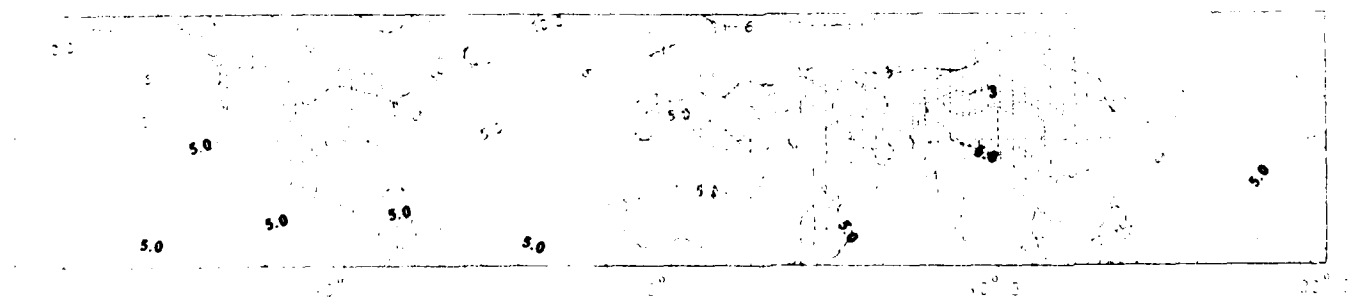
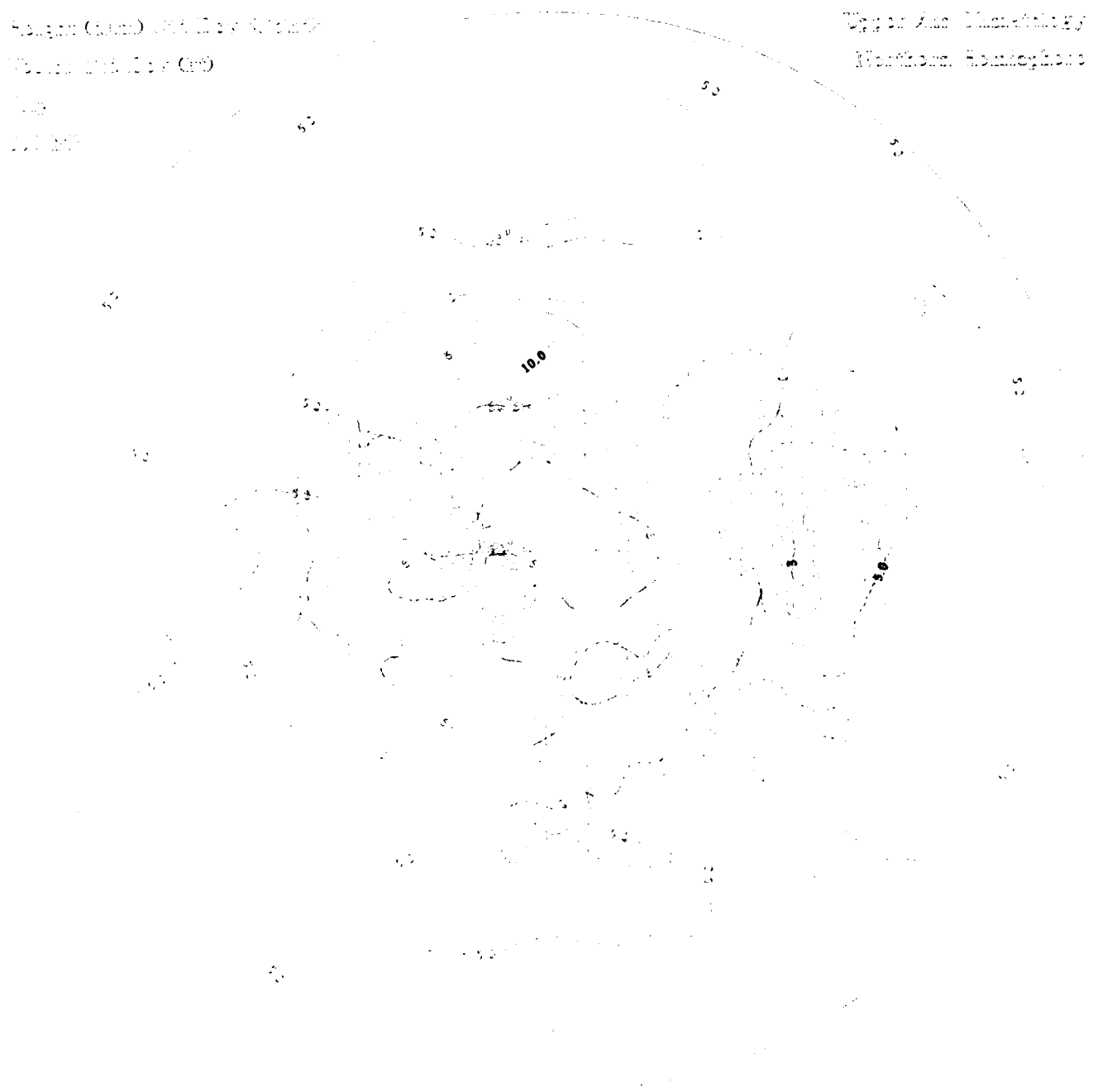
Water Level (ft)

100

1000

Upper San Francisco

Western Hemisphere



Topography
 Contour Interval: 1000

Height (ft) 000 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000 5100 5200 5300 5400 5500 5600 5700 5800 5900 6000 6100 6200 6300 6400 6500 6600 6700 6800 6900 7000 7100 7200 7300 7400 7500 7600 7700 7800 7900 8000 8100 8200 8300 8400 8500 8600 8700 8800 8900 9000 9100 9200 9300 9400 9500 9600 9700 9800 9900 10000 10100 10200 10300 10400 10500 10600 10700 10800 10900 11000 11100 11200 11300 11400 11500 11600 11700 11800 11900 12000 12100 12200 12300 12400 12500 12600 12700 12800 12900 13000 13100 13200 13300 13400 13500 13600 13700 13800 13900 14000 14100 14200 14300 14400 14500 14600 14700 14800 14900 15000 15100 15200 15300 15400 15500 15600 15700 15800 15900 16000 16100 16200 16300 16400 16500 16600 16700 16800 16900 17000 17100 17200 17300 17400 17500 17600 17700 17800 17900 18000 18100 18200 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51500 51600 51700 51800 51900 52000 52100 52200 52300 52400 52500 52600 52700 52800 52900 53000 53100 53200 53300 53400 53500 53600 53700 53800 53900 54000 54100 54200 54300 54400 54500 54600 54700 54800 54900 55000 55100 55200 55300 55400 55500 55600 55700 55800 55900 56000 56100 56200 56300 56400 56500 56600 56700 56800 56900 57000 57100 57200 57300 57400 57500 57600 57700 57800 57900 58000 58100 58200 58300 58400 58500 58600 58700 58800 58900 59000 59100 59200 59300 59400 59500 59600 59700 59800 59900 60000 60100 60200 60300 60400 60500 60600 60700 60800 60900 61000 61100 61200 61300 61400 61500 61600 61700 61800 61900 62000 62100 62200 62300 62400 62500 62600 62700 62800 62900 63000 63100 63200 63300 63400 63500 63600 63700 63800 63900 64000 64100 64200 64300 64400 64500 64600 64700 64800 64900 65000 65100 65200 65300 65400 65500 65600 65700 65800 65900 66000 66100 66200 66300 66400 66500 66600 66700 66800 66900 67000 67100 67200 67300 67400 67500 67600 67700 67800 67900 68000 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84700 84800 84900 85000 85100 85200 85300 85400 85500 85600 85700 85800 85900 86000 86100 86200 86300 86400 86500 86600 86700 86800 86900 87000 87100 87200 87300 87400 87500 87600 87700 87800 87900 88000 88100 88200 88300 88400 88500 88600 88700 88800 88900 89000 89100 89200 89300 89400 89500 89600 89700 89800 89900 90000 90100 90200 90300 90400 90500 90600 90700 90800 90900 91000 91100 91200 91300 91400 91500 91600 91700 91800 91900 92000 92100 92200 92300 92400 92500 92600 92700 92800 92900 93000 93100 93200 93300 93400 93500 93600 93700 93800 93900 94000 94100 94200 94300 94400 94500 94600 94700 94800 94900 95000 95100 95200 95300 95400 95500 95600 95700 95800 95900 96000 96100 96200 96300 96400 96500 96600 96700 96800 96900 97000 97100 97200 97300 97400 97500 97600 97700 97800 97900 98000 98100 98200 98300 98400 98500 98600 98700 98800 98900 99000 99100 99200 99300 99400 99500 99600 99700 99800 99900 100000 100100 100200 100300 100400 100500 100600 100700 100800 100900 101000 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158300 158400 158500 158600 158700 158800 158900 159000 159100 159200 159300 159400 159500 159600 159700 159800 159900 160000 160100 160200 160300 160400 160500 160600 160700 160800 160900 161000 161100 161200 161300 161400 161500 161600 161700 161800 161900 162000 162100 162200 162300 162400 162500 162600 162700 162800 162900 163000 163100 163200 163300 163400 163500 163600 163700 163800 163900 164000 164100 164200 164300 164400 164500 164600 164700 164800 164900 165000 165100 165200 165300 165400 165500 165600 165700 165800 165900 166000 166100 166200 166300 166400 166500 166600 166700 166800 166900 167000 167100 167200 167300 167400 167500 167600 167700 167800 167900 168000 168100 168200 168300 168400 168500 168600 168700 168800 168900 169000 169100 169200 169300 169400 169500 169600 169700 169800 169900 170000 170100 170200 170300 170400 170500 170600 170700 170800 170900 171000 171100 171200 171300 171400 171500 171600 171700 171800 171900 172000 172100 172200 172300 172400 172500 172600 172700 172800 172900 173000 173100 173200 173300 173400 173500 173600 173700 173800 173900 174000 174100 174200 174300 174400 174500 174600 174700 174800 174900 175000 175100 175200 175300 175400 175500 175600 175700 175800 175900 176000 176100 176200 176300 176400 176500 176600 176700 176800 176900 177000 177100 177200 177300 177400 177500 177600 177700 177800 177900 178000 178100 178200 178300 178400 178500 178600 178700 178800 178900 179000 179100 179200 179300 179400 179500 179600 179700 179800 179900 180000 180100 180200 180300 180400 180500 180600 180700 180800 180900 181000 181100 181200 181300 181400 181500 181600 181700 181800 181900 182000 182100 182200 182300 182400 182500 182600 182700 182800 182900 183000 183100 183200 183300 183400 183500 183600 183700 183800 183900 184000 184100 184200 184300 184400 184500 184600 184700 184800 184900 185000 185100 185200 185300 185400 185500 185600 185700 185800 185900 186000 186100 186200 186300 186400 186500 186600 186700 186800 186900 187000 187100 187200 187300 187400 187500 187600 187700 187800 187900 188000 188100 188200 188300 188400 188500 188600 188700 188800 188900 189000 189100 189200 189300 189400 189500 189600 189700 189800 189900 190000 190100 190200 190300 190400 190500 190600 190700 190800 190900 191000 191100 191200 191300 191400 191500

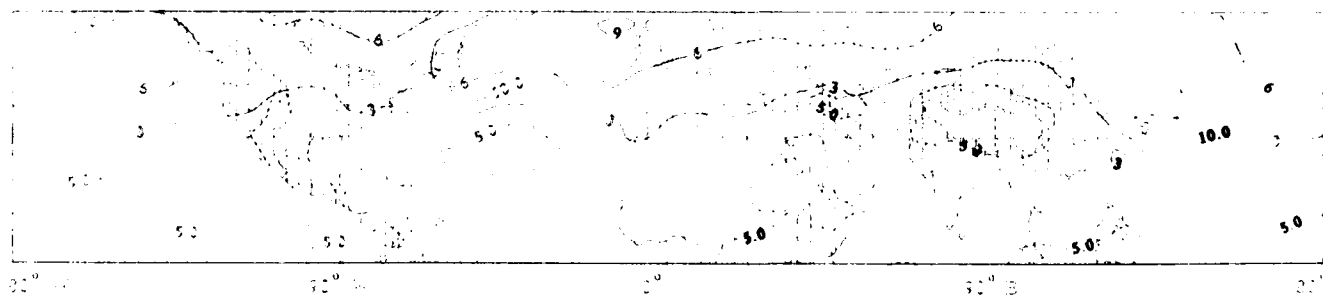
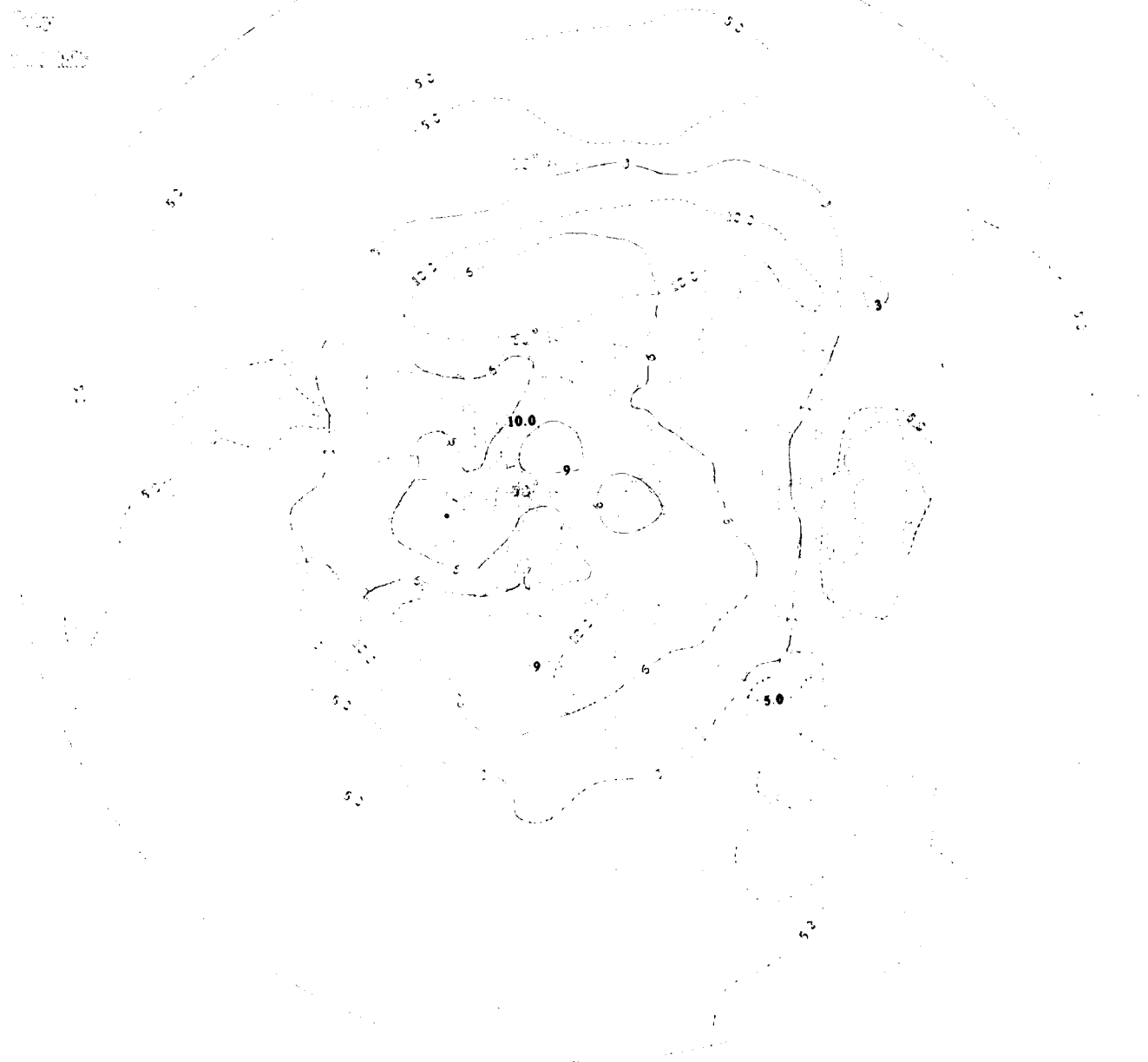
Height (ft) Oct. Day 1961

Tide Oct. Day 1961

Day
1961

Depth (ft) Oct. Day 1961

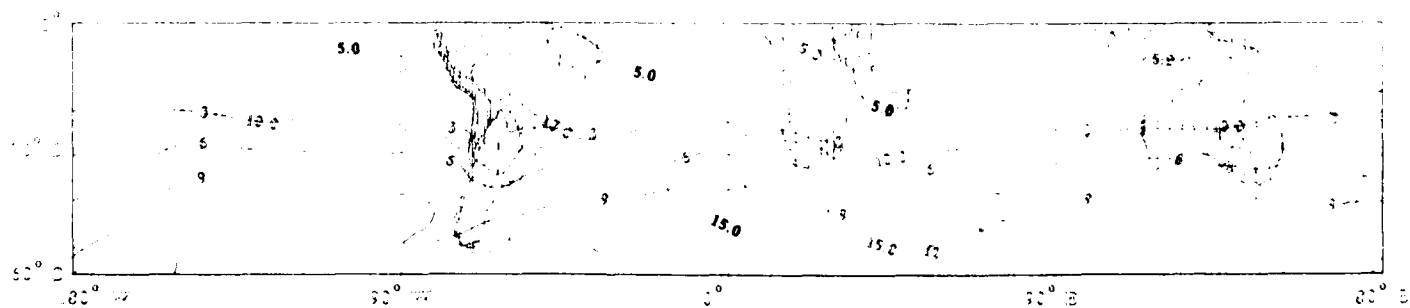
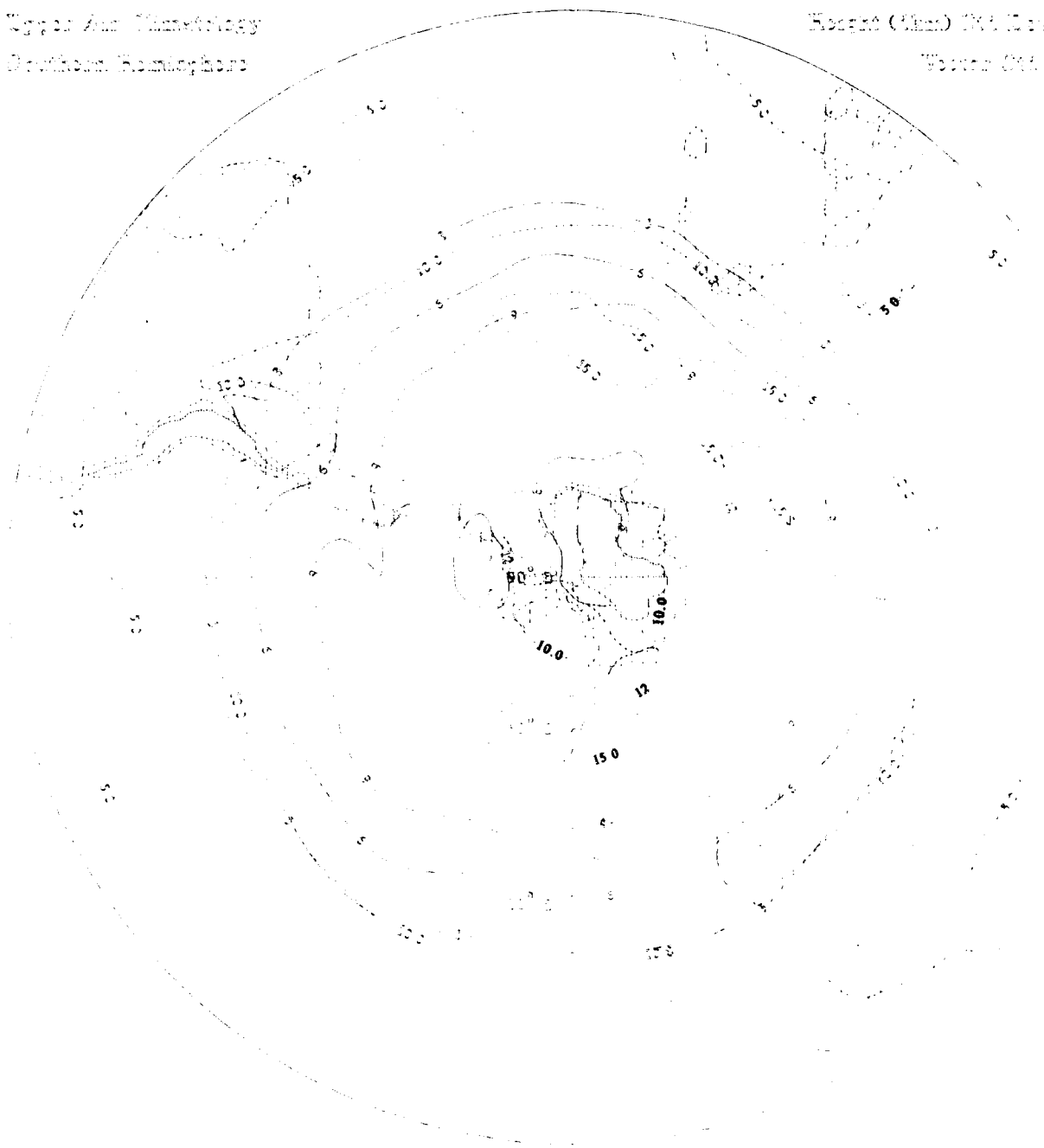
Depth (ft) Oct. Day 1961



Upper Air Massology
 Southern Hemisphere

Height (km) 1000 500 0
 Volume (km³) 100 50 0

Fig.
 11. 200



Height (mm) 24.5 by 10.0

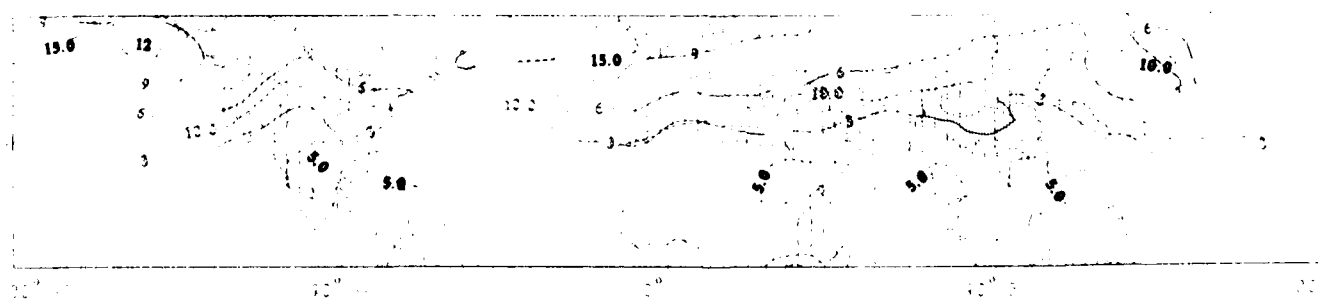
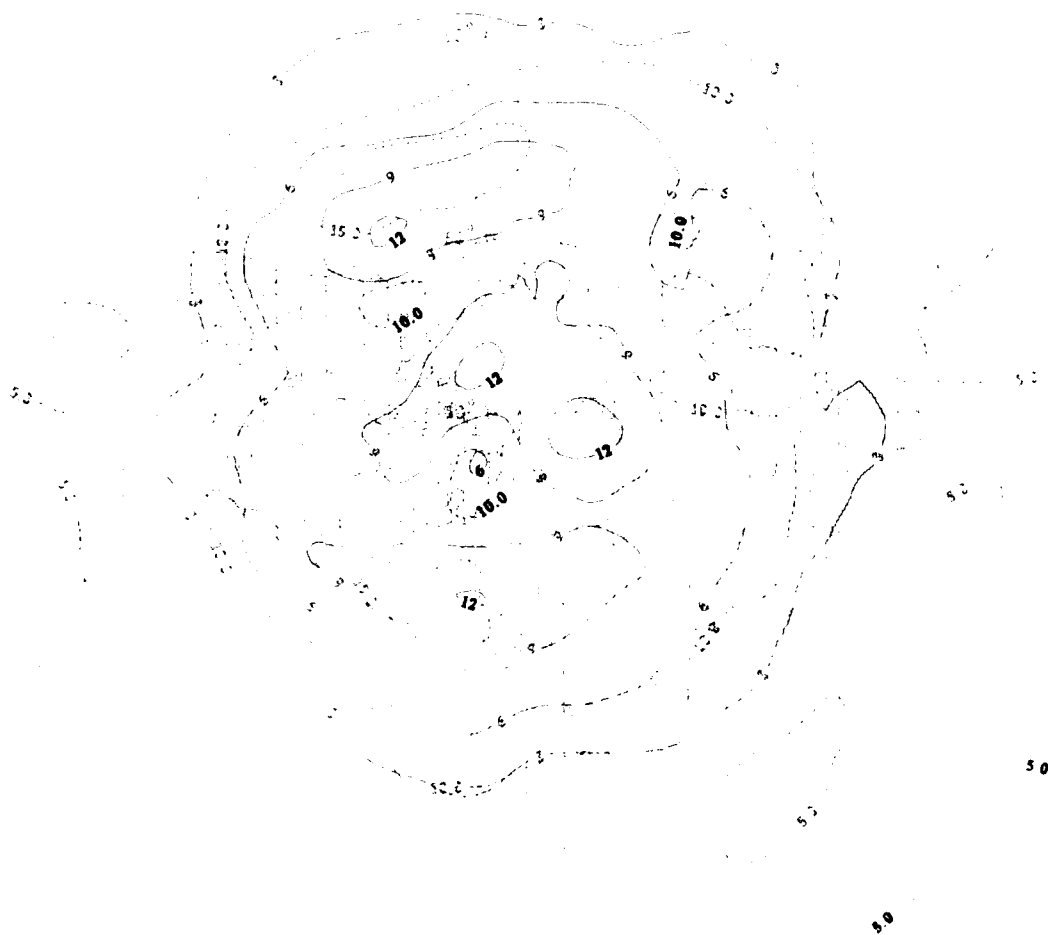
Width (mm) 24.5 by 10.0

Age

19.0

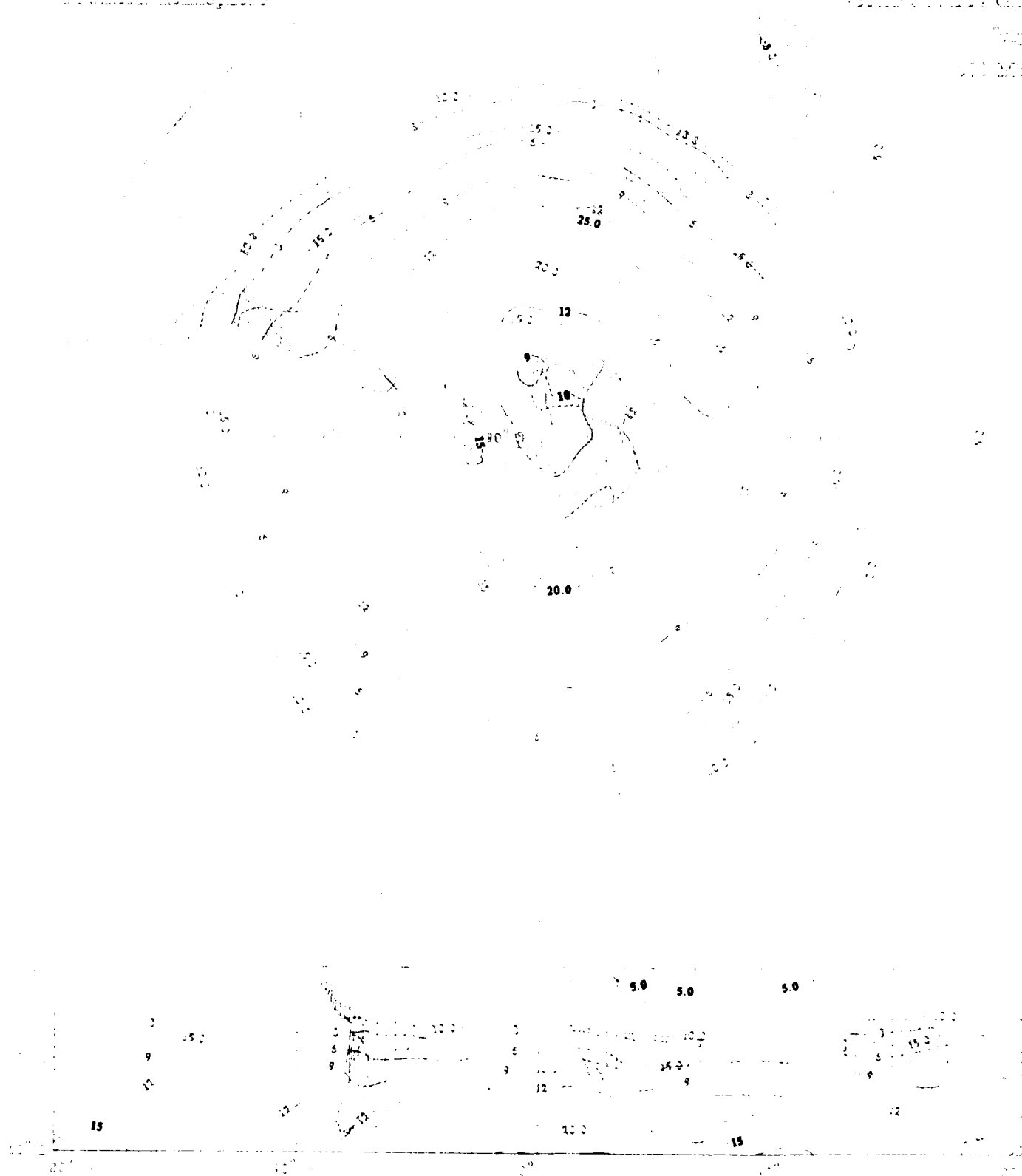
Typical Climate

Northern Hemisphere



Topographic
Southern Hemisphere

Region (Gm) Off. Rev. (Gm)
 1000
 1000
 1000



Height (km) vs. Time (min)

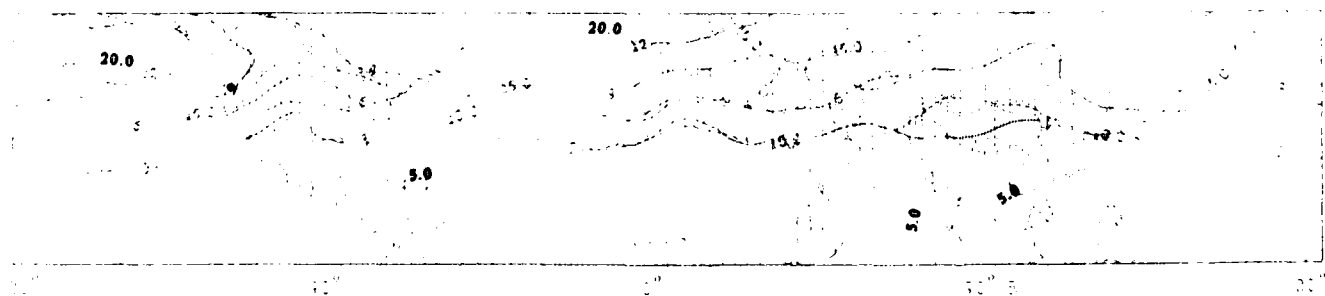
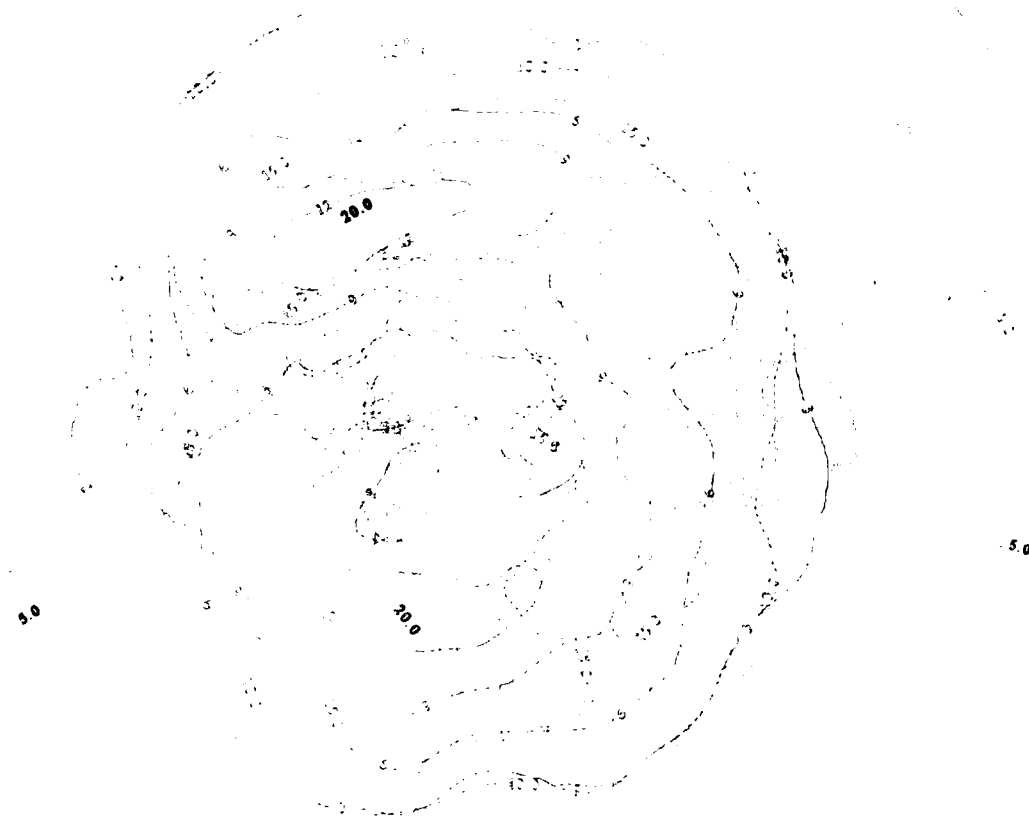
Time (min) vs. Height (km)

Time

Height

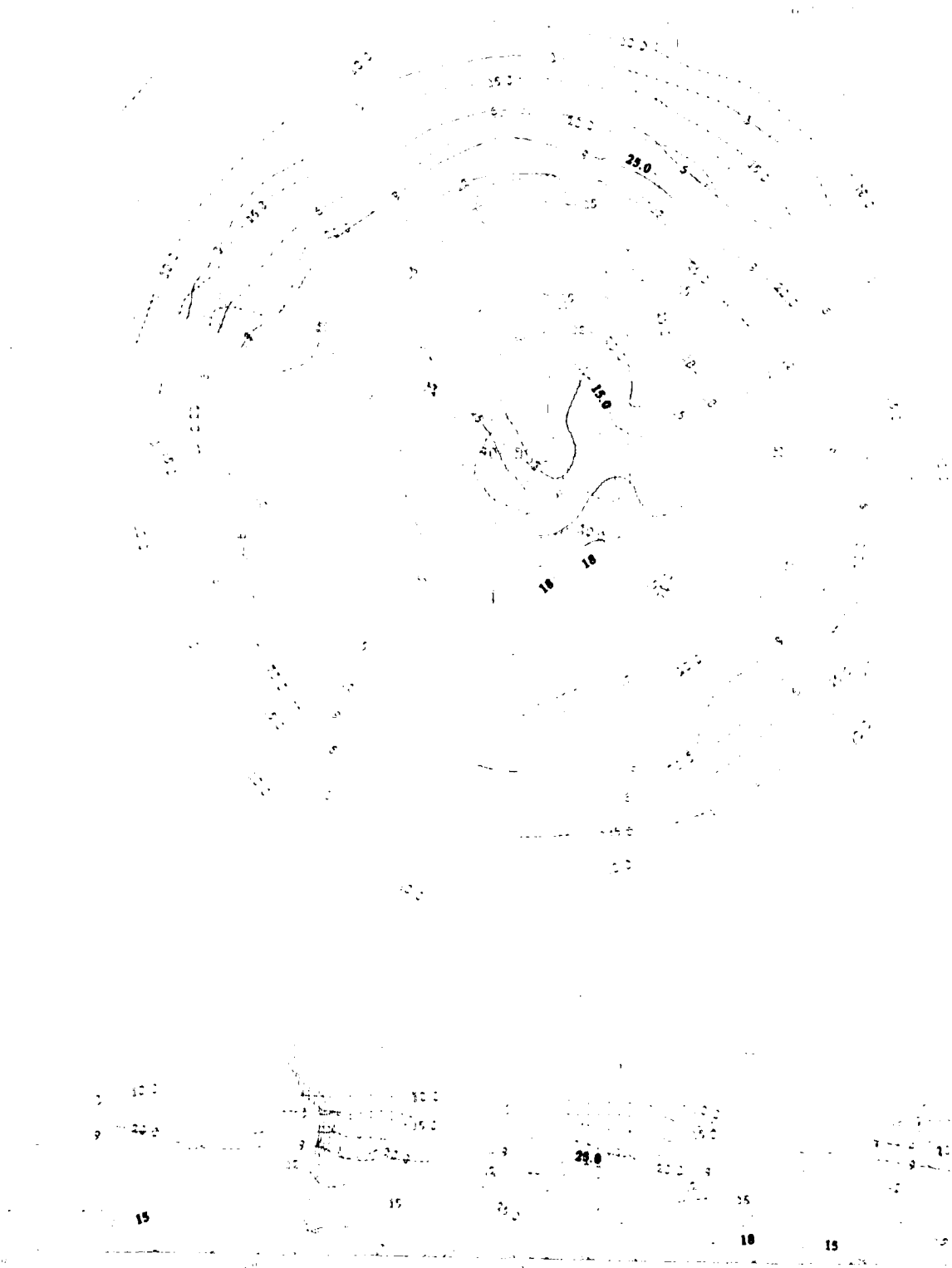
Upper / Lower Hemisphere

Minimum / Maximum



Topographic Map
 Contour Interval 100 Feet

Height (ft) 100 Feet
 Width (ft) 100 Feet



Height (km) vs. Day (Day)

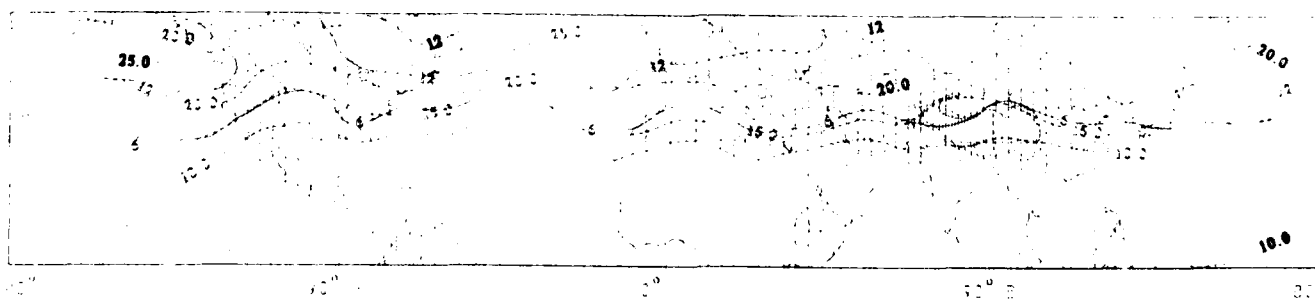
Time (Day) (hr)

Day

100000

Upper / Lower Hemisphere

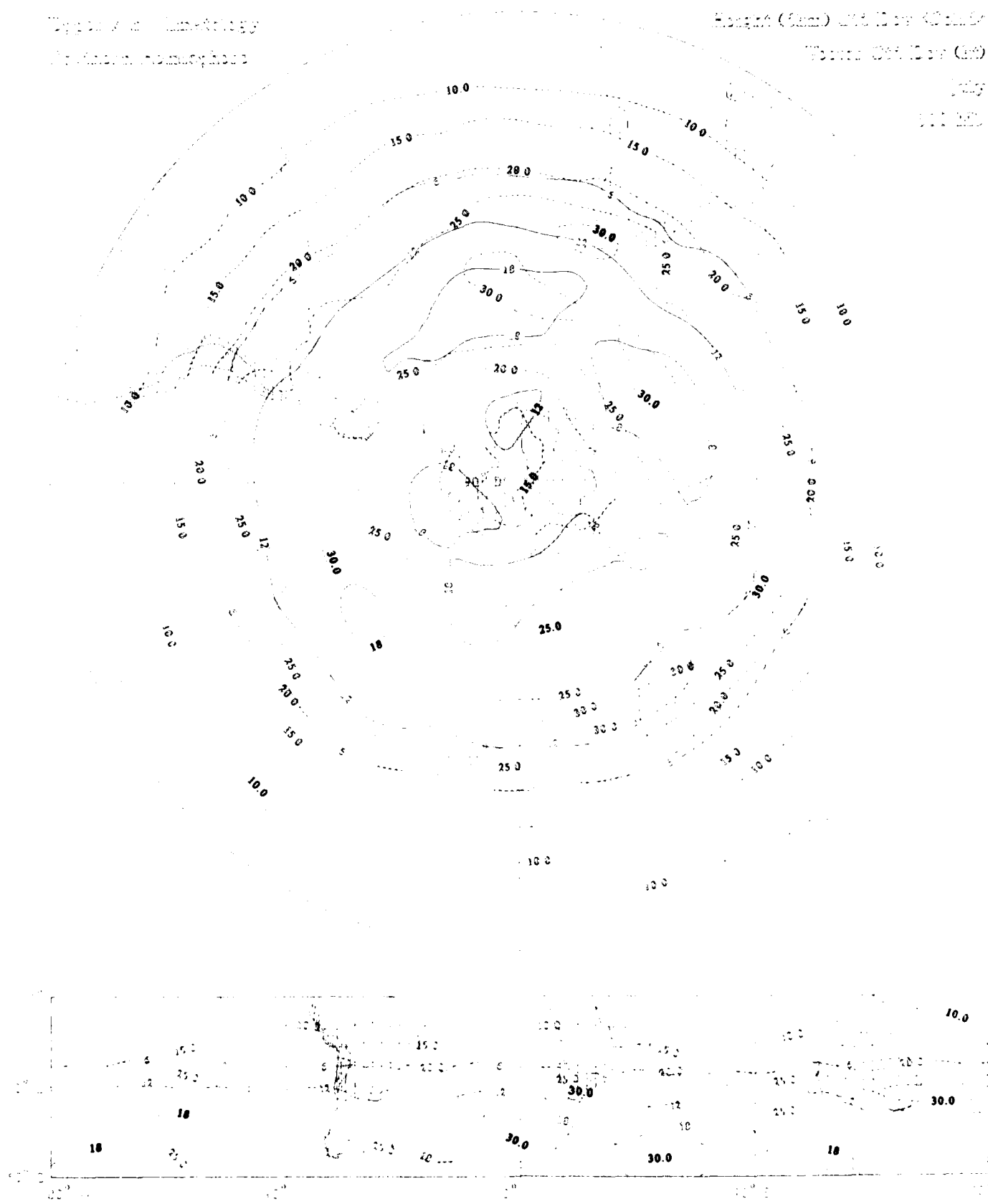
Horizontal Hemisphere



Depth (m) Contour
 10.0 15.0 20.0 25.0 30.0

Height (mm) and Day (mm)
 10.0 15.0 20.0 25.0 30.0

10.0 15.0 20.0 25.0 30.0



Height (km) Std Dev (Solid)

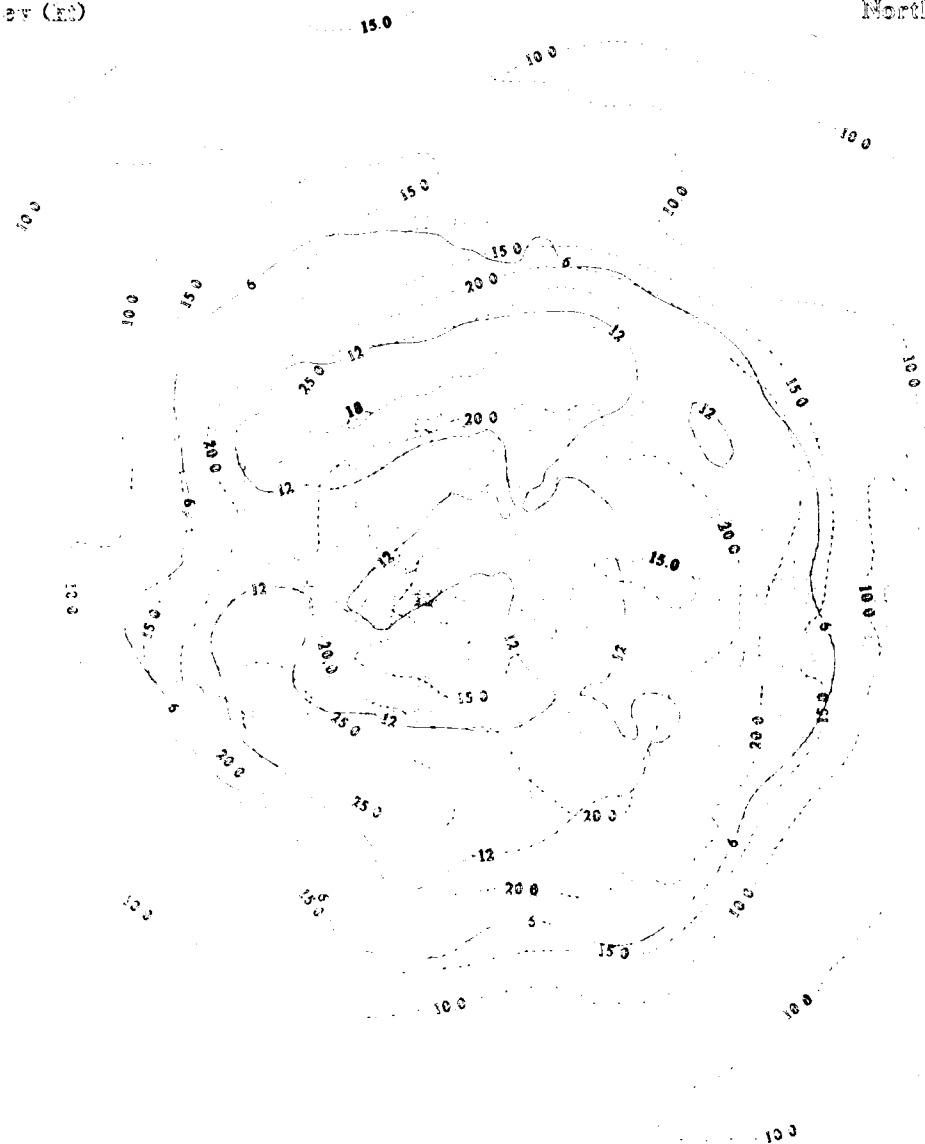
Wester Std Dev (in)

July

1951-1952

Upper Air Climatology

Northern Hemisphere



Types and Dimensions
 Circular Hemisphere

Height (ft) Dia. D at (ft)

Table Dia. D at (ft)

Table
 1000 ft



Region (km) Sea Day (km)

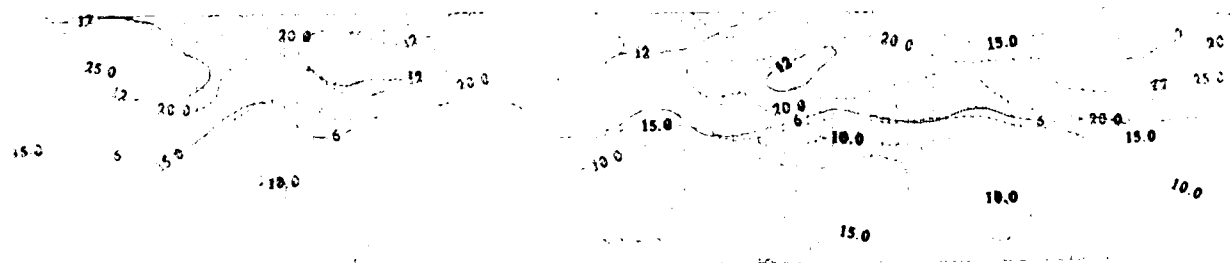
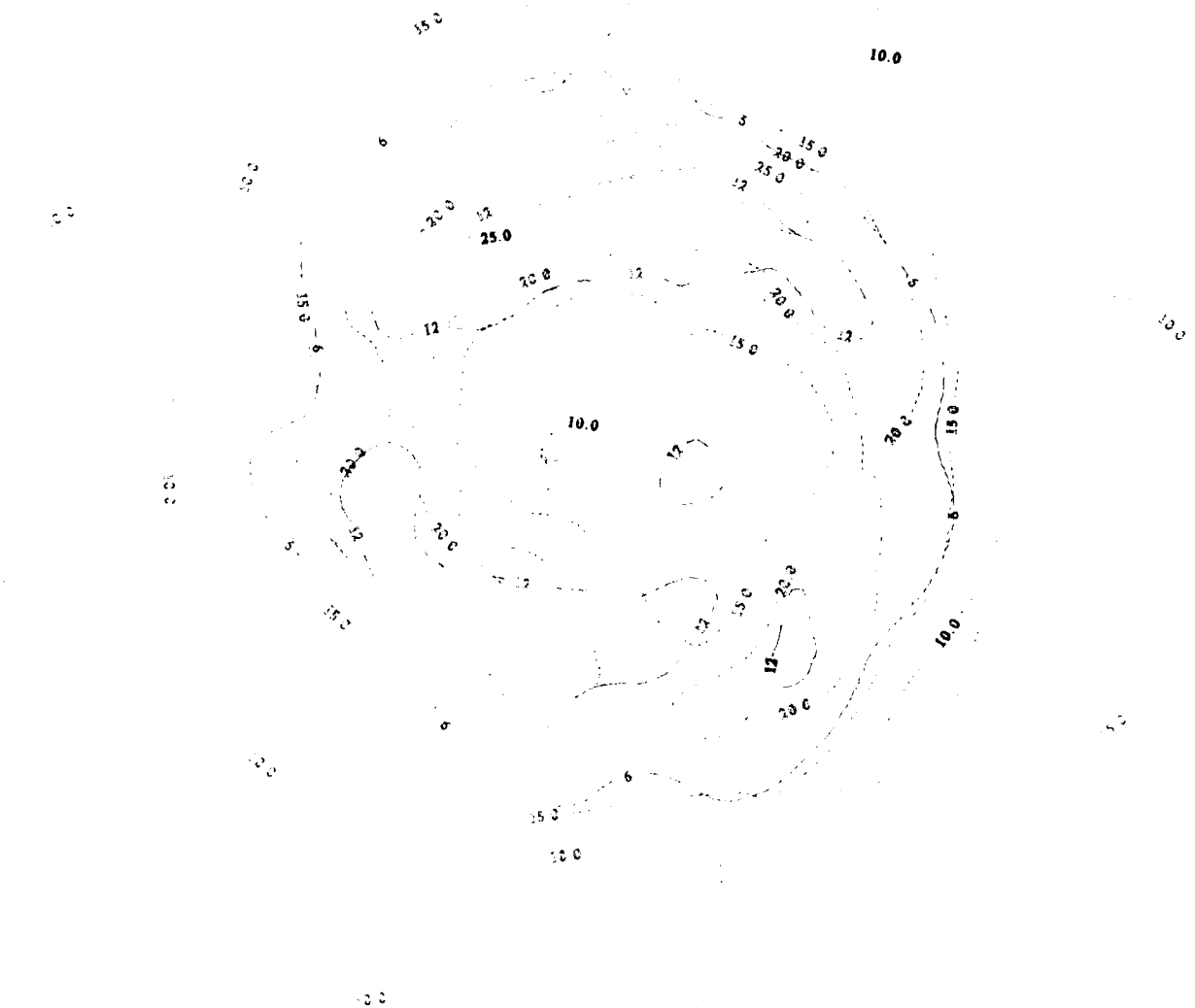
Test: Sea Day (km)

July

100000

Upper Air Climatology

Northern Hemisphere



Water and Humidity
and Temperature

Height (mm) 20.0 10.0 5.0
Water 20.0 10.0 5.0

10.0
5.0



Height (km) Std Dev (GMS)

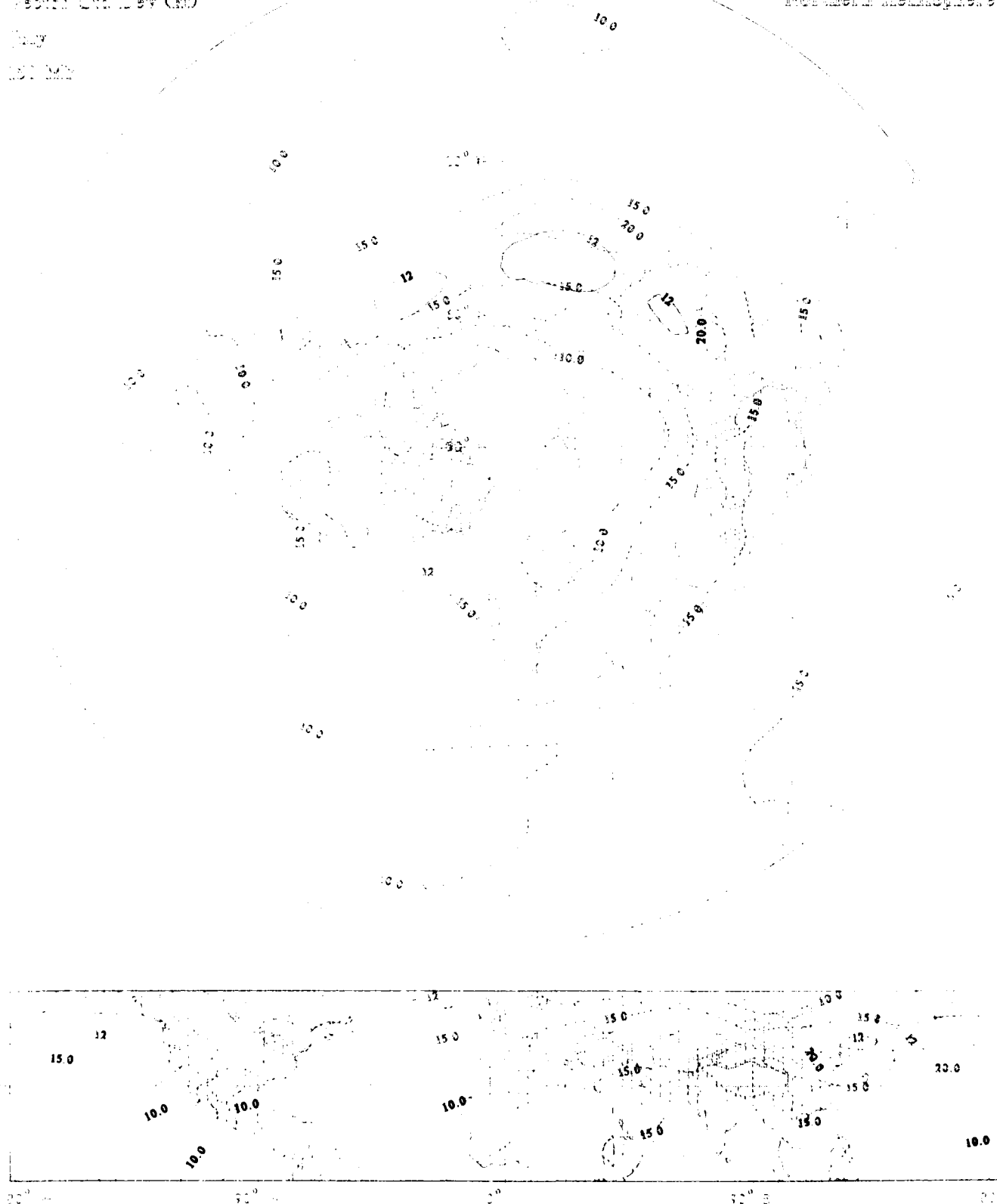
Temp Std Dev (m)

Day

101 MAY

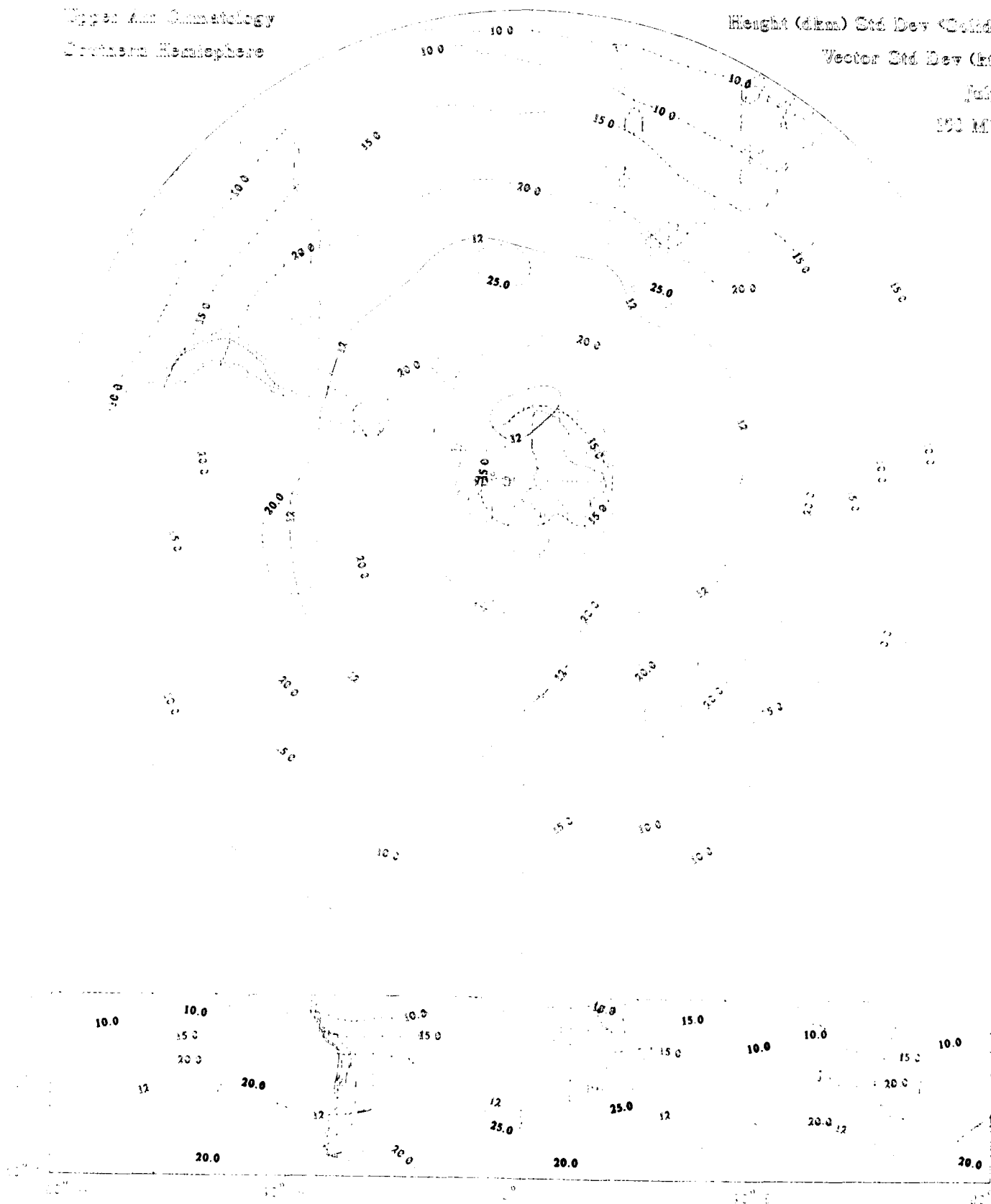
Upper Air Climatology

Northern Hemisphere



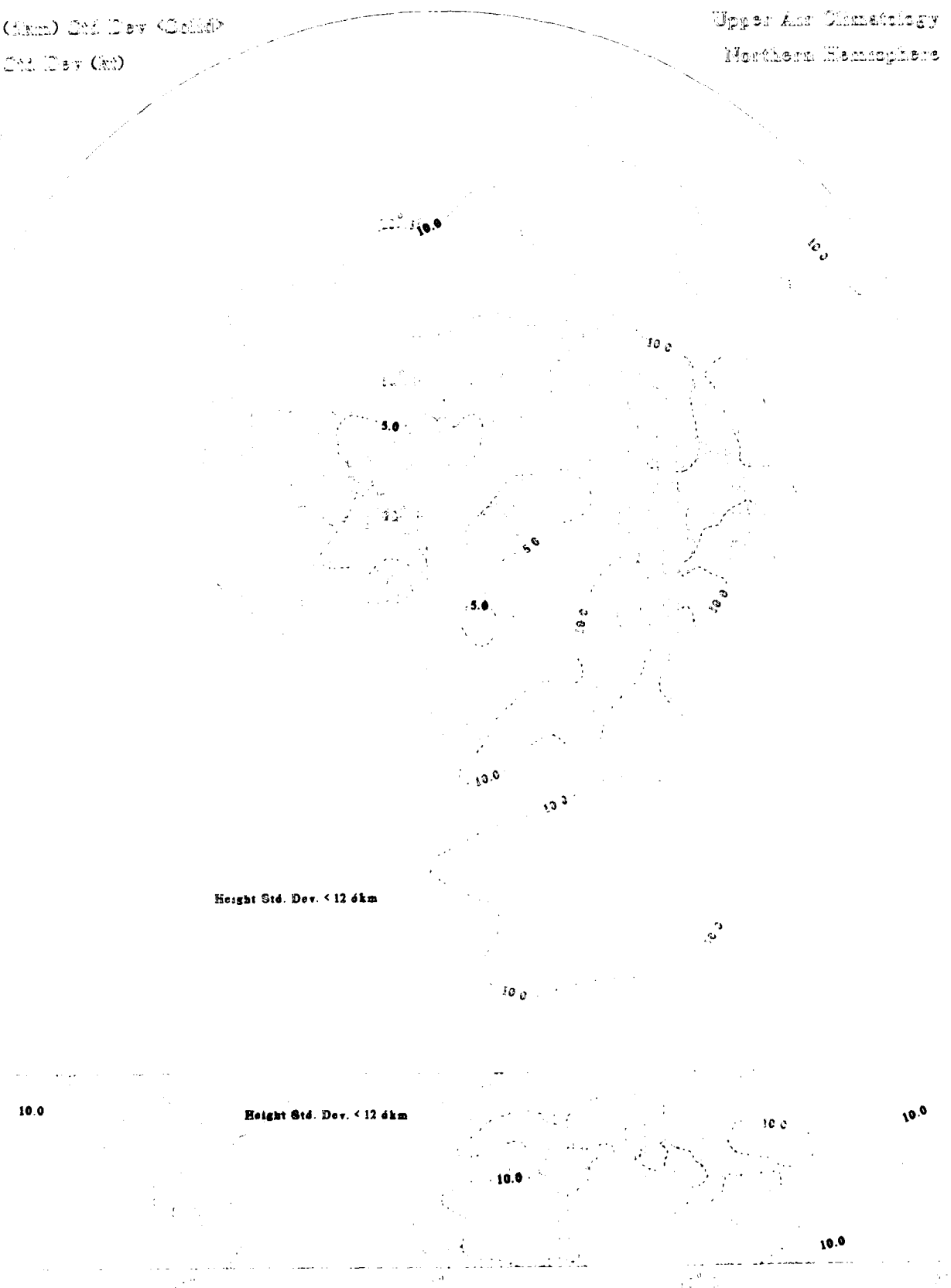
Upper Air Climatology
Northern Hemisphere

Height (km) Std Dev (km)
Vector Std Dev (kt)
July
191 MB



Upper Air Climatology

Northern Hemisphere



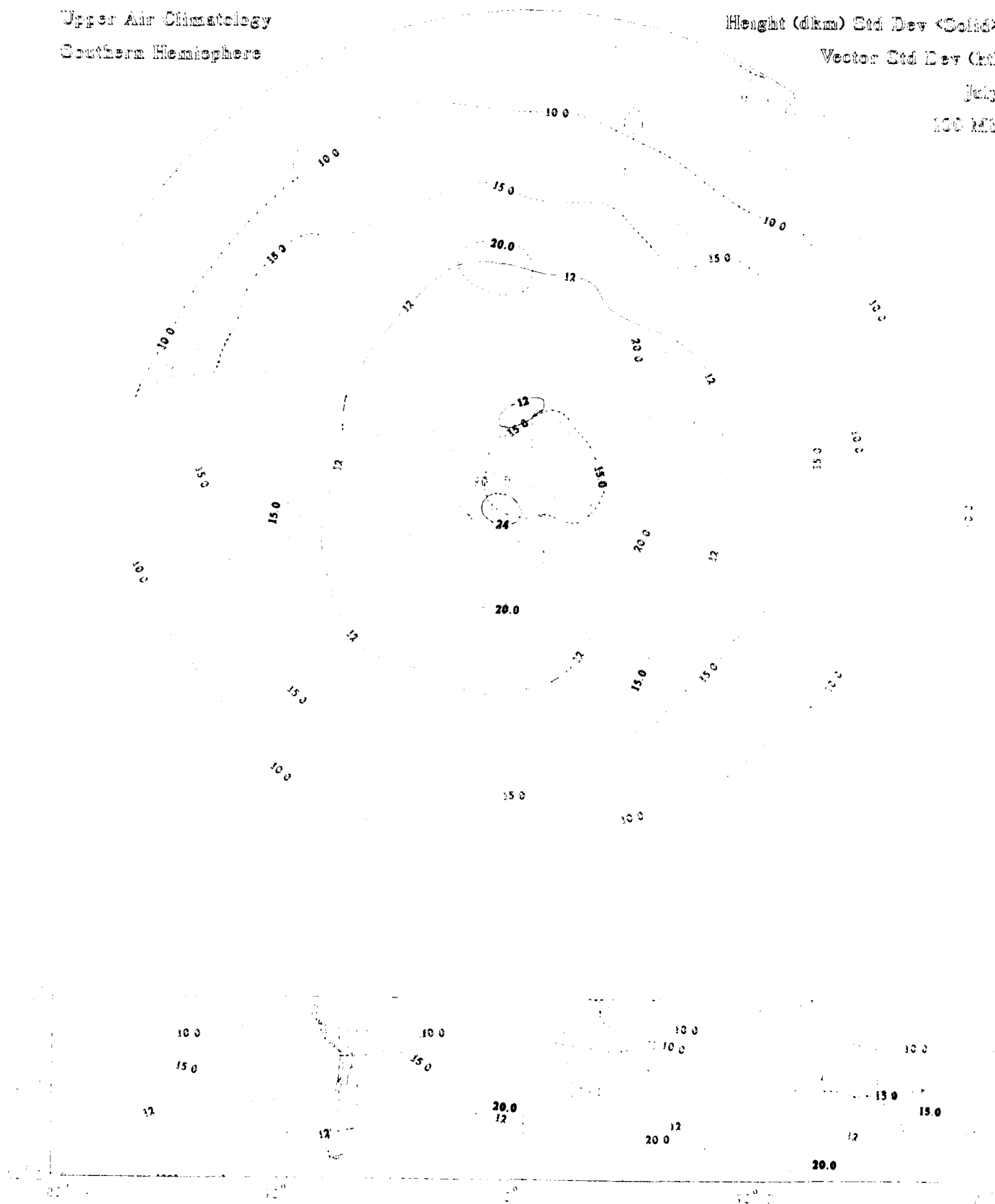
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>

Vector Std Dev (ht)

July

100 hPa



Height (km) Std Dev <Solid>

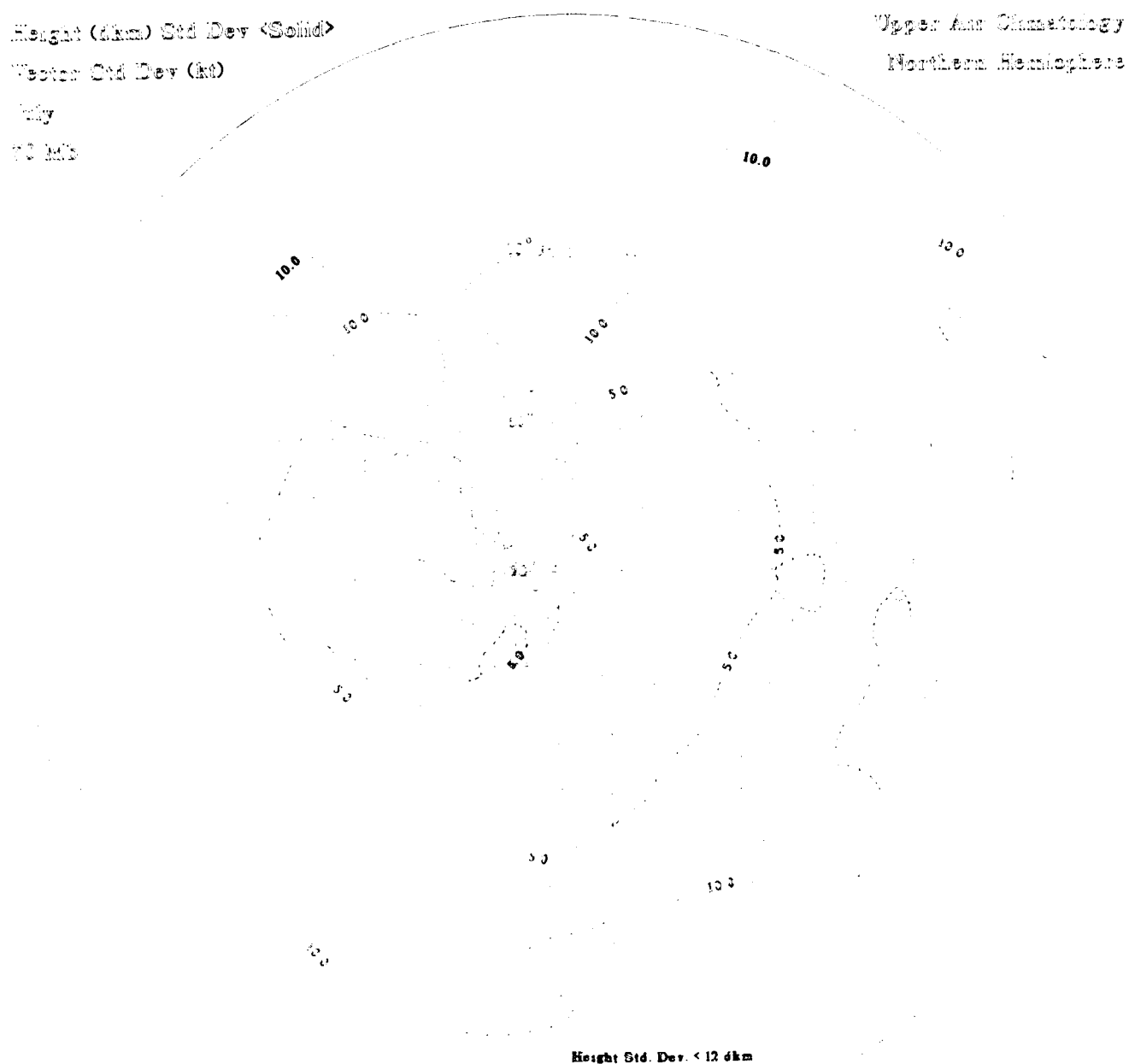
Vector Std Dev (kt)

July

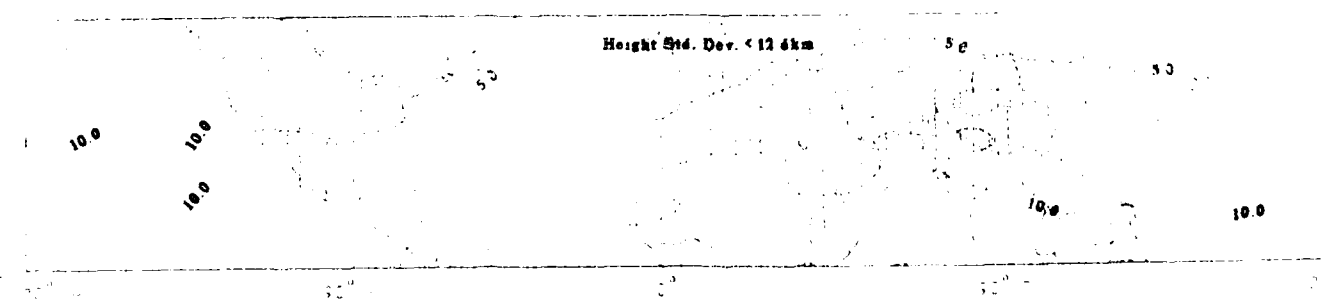
10 m/s

Upper Air Climatology

Northern Hemisphere



Height Std. Dev. < 12 km



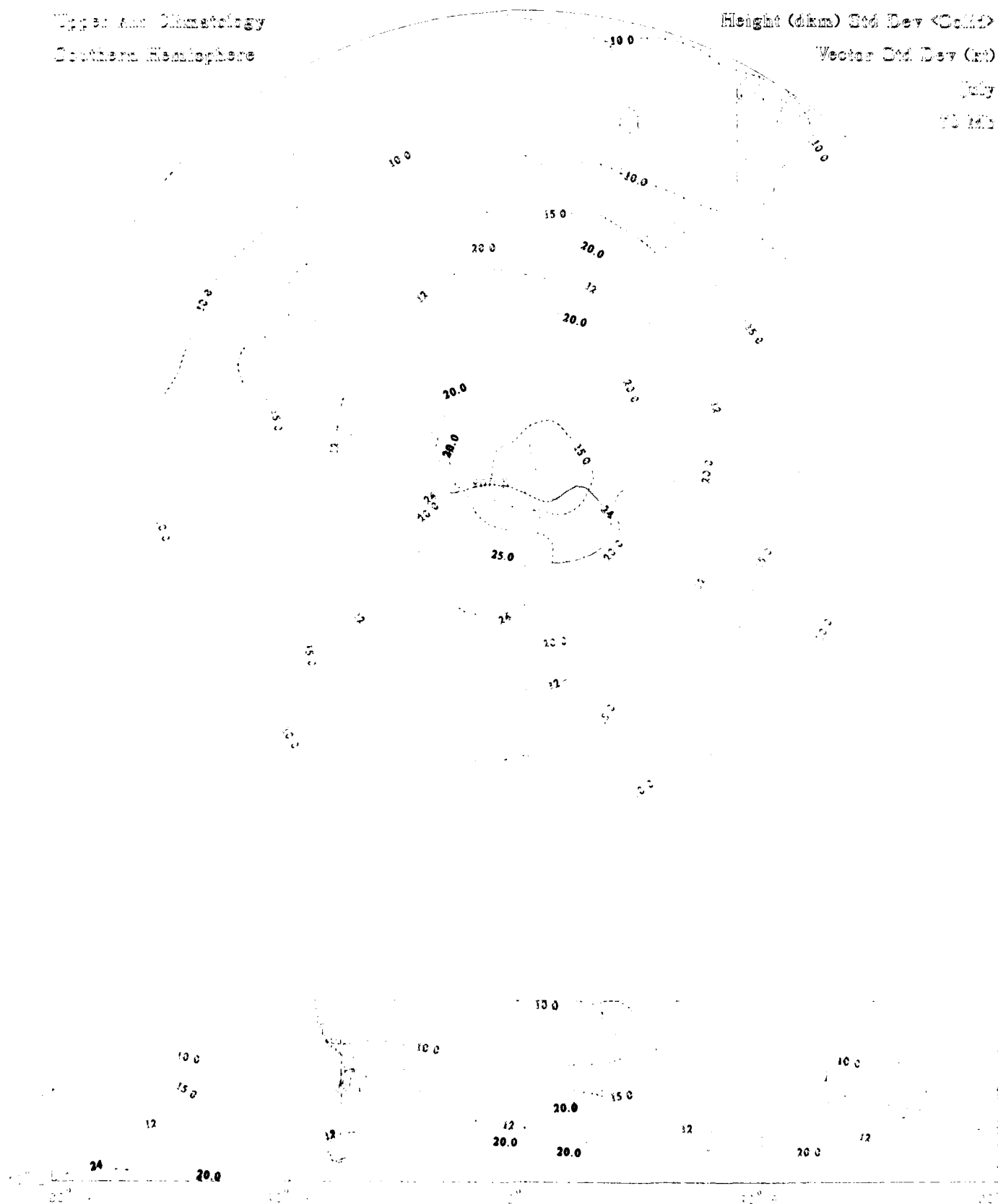
Height Std. Dev. < 12 km

Types and Climatology
Southern Hemisphere

Height (dkm) Std Dev <Cont>

Vector Std Dev (m)

July
10 km



Height (dkm) Std Dev <Solid>

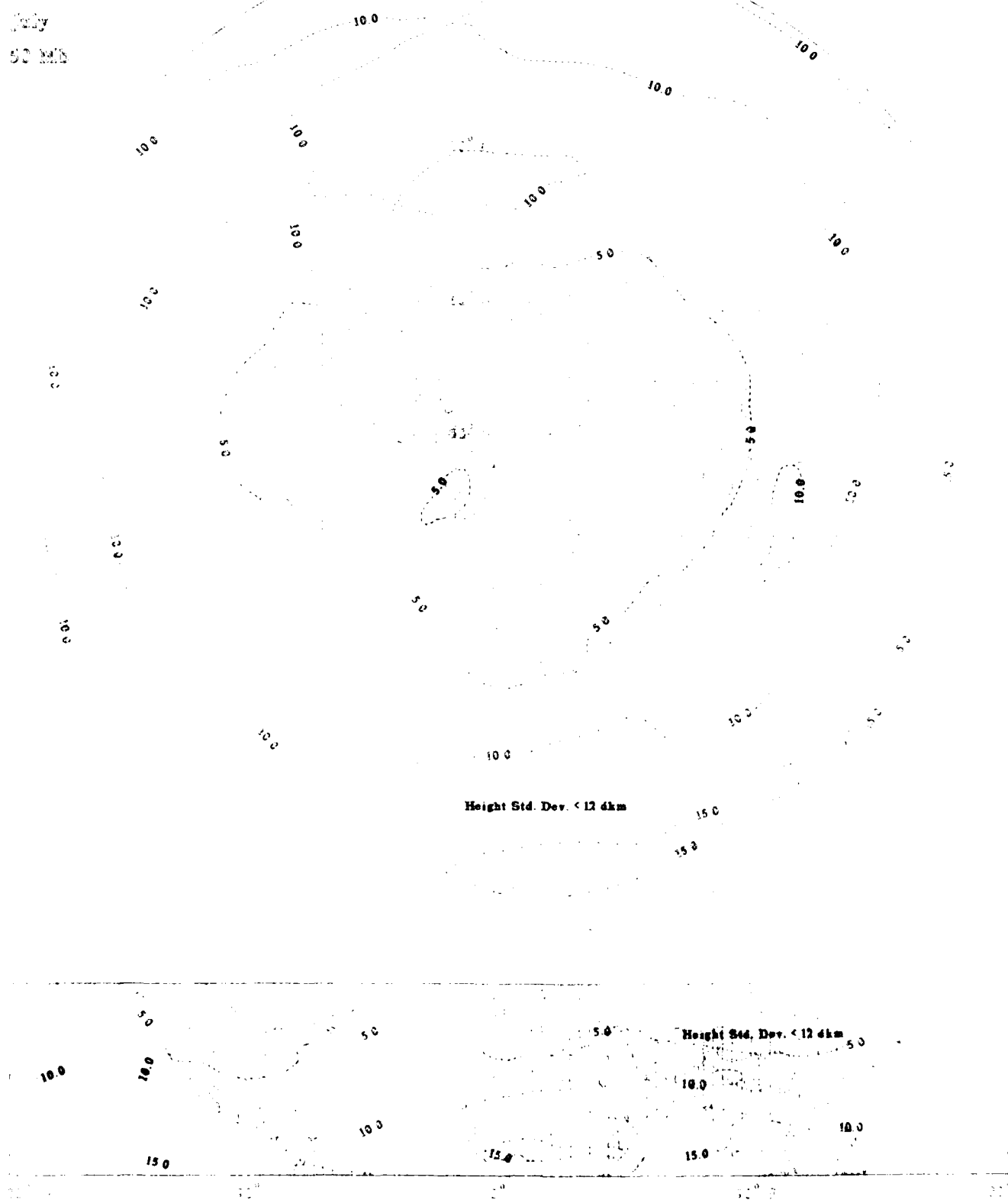
Vector Std Dev (kt)

July

50 mb

Upper Air Climatology

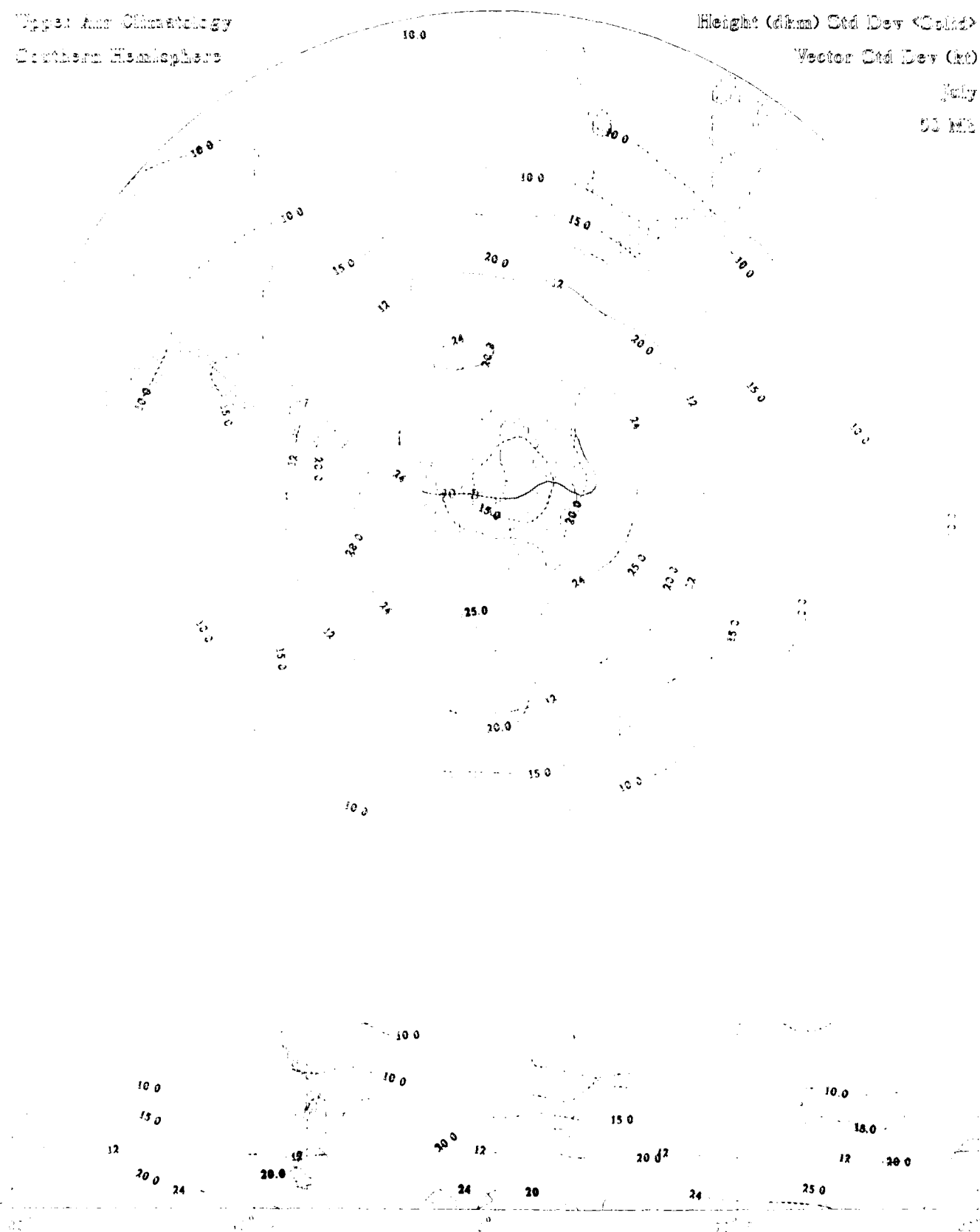
Northern Hemisphere



Upper Air Climatology
 Southern Hemisphere

Height (dkm) Std Dev (Cm)
 Vector Std Dev (kt)

July
 00 ME



Height (km) Std. Dev. (km)

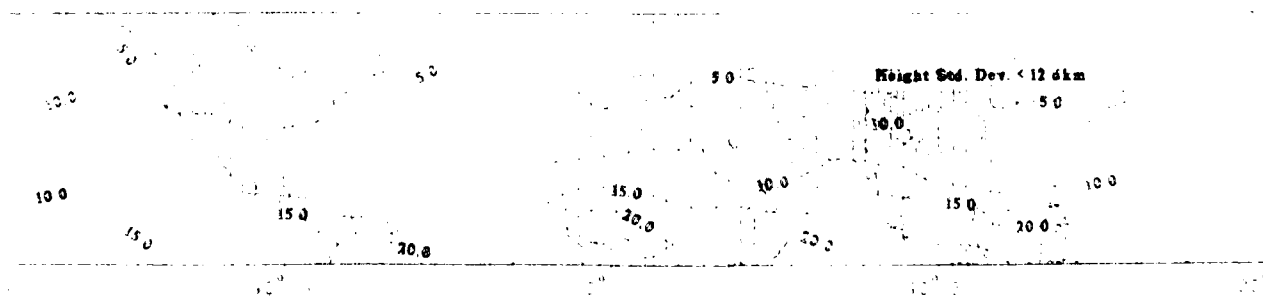
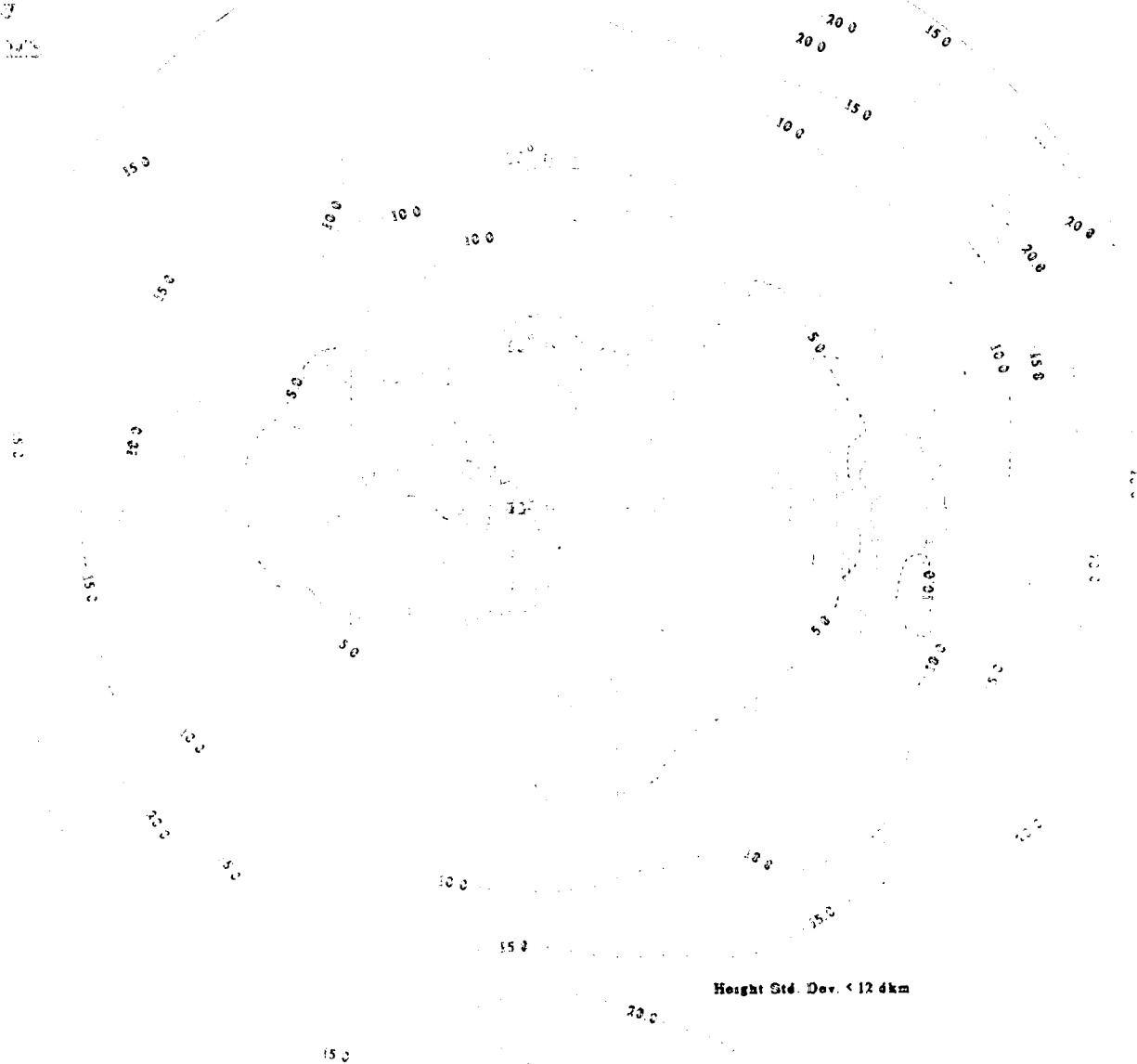
Height (km) Std. Dev. (km)

July

1960

Upper Air Climatology

Northern Hemisphere



Height (dkm) Std Dev (km)
Vector Std Dev (m)

100

2000

